AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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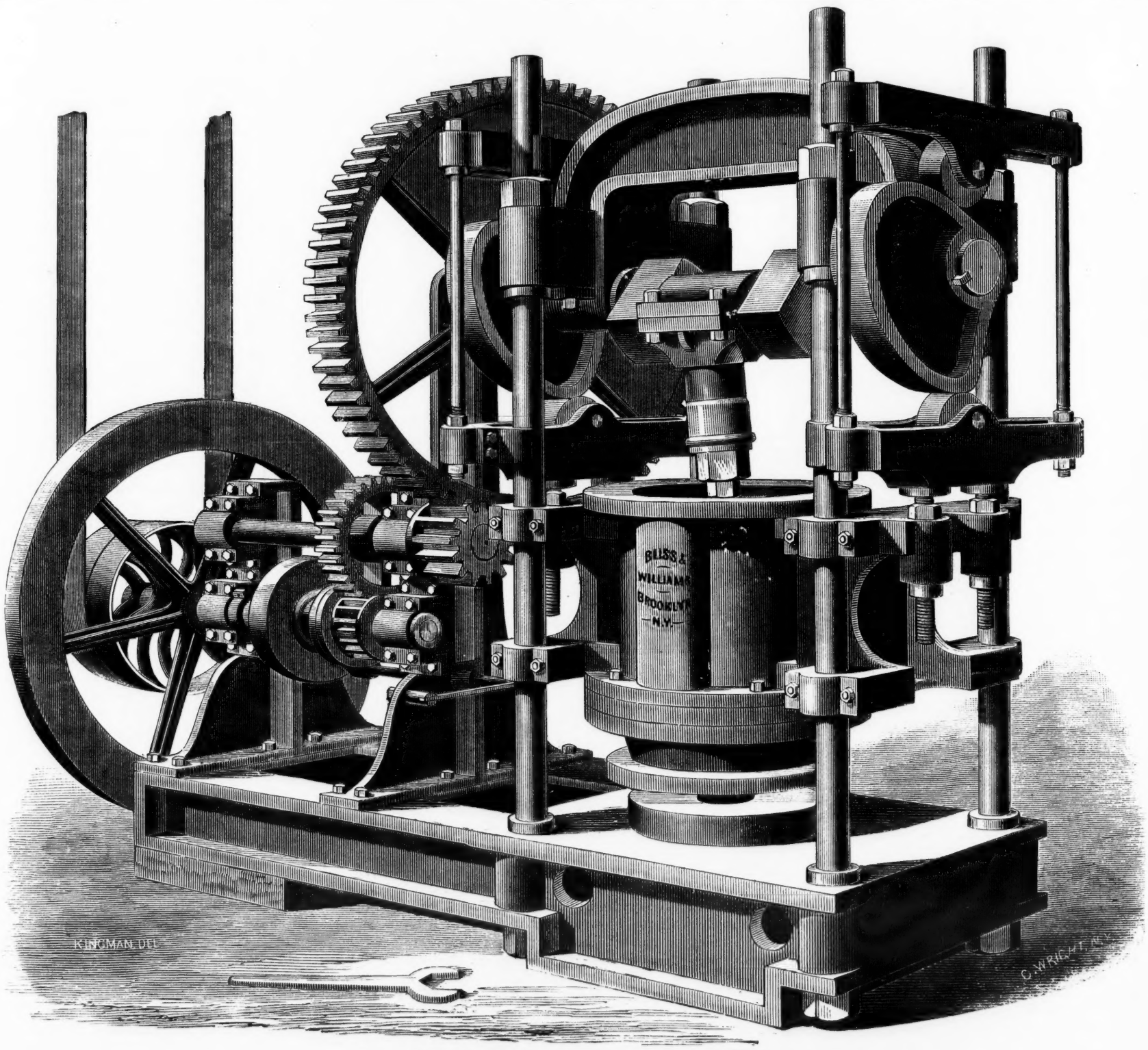


SINGLE CRANK POWER DRAWING PRESS, BY BLISS & WILLIAMS.

Single Crank Power Drawing Press.

This press is a later and less expensive form of the Power Drawing Press (double crank), introduced about a year and half ago, and is intended for more general use.

Probably, no tool has ever been invented which would, more nearly than the one under consideration, answer the old-time facetious description of a machine into which boxes of tin-plate may be fed on one side, guaranteed to come out on the other in the form of manufactured goods, packed, marked and ready for shipment.

This, and the other styles and sizes of Drawing Press that are kin to it, have, to a great extent, revolutionized the method of making what is usually termed stamped ware in America, having almost wholly displaced the old-fashioned drop for this class of work.

Tea kettle breasts and bottoms, tea trays, bird cage bottoms, milk and frying pans, &c., &c. may be drawn on this press, it being available for almost any style of drawn work.

The frame consists of four 3½ inch iron rods, turned true and polished, which are also used as guides, thereby giving great strength and leaving the press open on three sides, an arrangement which admits plenty of light upon the work, while rendering access to all the parts very easy. On this latter account the adjustment of the press can be made without difficulty. The press takes up but little space.

The same cam that carries down the pressure-plate, or blank holder, also lifts it. The cam is so designed that there is a rest of about one-third at each end of the stroke. The adjustment of the blank holder is made positive by means of screws, without the use of either springs or weights. The plunger which carries the punch, or male die, slides in guides inside the blank holder. The cams are of steel, and the rollers have cast steel surfaces shrunk upon cast-iron centers; by this means an exceedingly hard working surface is obtained.

The bearings are all lined with pure bronze metal. The following dimensions and particulars are appended in tabular form below:

Weight, complete, about	15,000 lbs.
Distance from bed to bottom of blank holder, when blank holder is up	19 inches.
Length of stroke of blank holder	10 "
" " " punch	12 "
Adjustment of blank holder and punch	6 "
Will receive blank, diameter	26 "
" " drawing punch, diam.	18 "
Diameter of balance wheel	51 "
Width " "	4 "
Weight " "	950 lbs.
Speed " " pr. min.	180 rev.
Geared 20 to 1, which operates press	9 "
Diameter of tight and loose pulleys on counter shaft	24 inches.
Width of ditto	5 "

Taken altogether, it is one of the most

ingenious tools ever executed, and is a fair specimen of the class of mechanical inventions which have reflected such deserved luster upon the American name all over the world.

Its inventors and makers can very truthfully say in the words of the play, "The world is mine oyster," as this and similar machines are furnished by them for use in almost every part of the civilized world.

It is made by Bliss & Williams, corner of Plymouth and Jay streets, Brooklyn, N. Y.; and in connection with the other specialties of this celebrated firm, is being very ably and successfully introduced abroad by Mr. A. H. Fancher, whose headquarters are at 47 Wool Exchange, Coleman Street, London, E. C., England.

Continuation of Injector Experiments.

BY WM. J. WILLIAMS.

In March number of the MACHINIST I contributed an article showing the results of some experiments with a No. 4 Sellers Injector, under certain given conditions. It was shown what quantity of water and its temperature, at different pressures of steam, might be expected. A formula was given to find the approximate cost of heating a given quantity of water as discharged by the injector to the boiling point. Or, in other words, how many pounds of steam would be required of the different pressures mentioned to heat 100 lbs. of water as discharged by the injector, to the temperature of 212°. The question: what quantity of each of the 8¾ gallons, mentioned in the table, was due to the steam which forced the feed water into the experimenting vessel, was not discussed. Since then, some attempts have been made with the same injector to ascertain these points; the results noted in the table below were attained by disconnecting the feed-pipe of injector from pipe connections with street main, and making the injector lift its water from a suitable vessel underneath, holding a given number of pounds of water. It discharged into another vessel, placed on a pair of scales, the increase of weight in the receiving vessel being taken as the amount of steam that was required to change the position of the feed water. The temperature of the resultant, or discharged water, was obtained by holding a thermometer close to the end of the discharge-pipe as long as there was any flow of water. It was noticed that the temperature was seldom stationary, rising and falling to an extent of 1°; the temperature noted in the table is that where the thermometer finally settled. The same boiler was used as on the former occasion, and under the same conditions; that is, no other work being done at the time the experiments were carried out. As it is hereafter intended to discuss how much it *ought* to have taken to impart a certain temperature to the given amount of feed-water with the different pressures used, if it is found to be too much I do not think it would be fair to blame the boiler for furnishing steam super-saturated with water. The boiler that produced the steam for the experiments is of the flue kind; it is 18 feet 6 inches long, 42 inches diameter, with two 11-inch flues, externally fixed, the draught passing underneath and returning through both flues, and thence over the top to the chimney; the gross surface is 20 square feet; the steam for the injector was taken from a point 2 feet above the water-line; and, as it was not used for any purpose for 12 hours previous, there could not be any great agitation of the water within to cause suspended particles to be carried over. The vessels for 50 lbs. pressure are not very satisfactory, but they are given as they occurred, and without any attempt to *doctor* them up; no less than ten trials were made at this pressure; but no two results could be attained alike. There was no reason known why there should be any changes anywhere, or that it was any more likely that there would be changes than at the higher pressures where it seemed one might go on indefinitely and get the same results; but changes must have occurred, or like results would have been produced.

RECORD OF EXPERIMENTS.

Distance from feed-water to injector in inches.	Height of point of delivery above injector.	Temperature of feed-water.	Quantity of feed-water in lbs	Steam pressure as per gauge.	Quantity of resultant water in lbs.	Temperatue of resultant water.	Length of delivery-pipe in inches.
31	18	58°	72	50	78¾	128°	34
31	18	58°	72	50	75	126°	34
31	18	58°	72	50	79½	123°	34
31	18	58°	72	60	78¼	131°	34
31	18	58°	72	60	78¼	131°	34
31	18	58°	72	60	78¼	130°	34
31	18	58°	72	70	79¼	135°	34
31	18	58°	72	70	78½	134°	34
31	18	58°	72	70	78½	134°	34
31	18	58°	72	70	78½	134°	34

As will be seen from the above record, there is great regularity for 60 lbs. pressure, the only variation is in the third trial in the temperature of resultant water, a difference of one degree. This might easily have been written to agree with the others, but the experimenting has been done solely with the view to find out what does occur, and not to make false records to suit personal opinions on the subject, leaving any differences that may present themselves contrary to expectations, to be solved, if possible, at a future time.

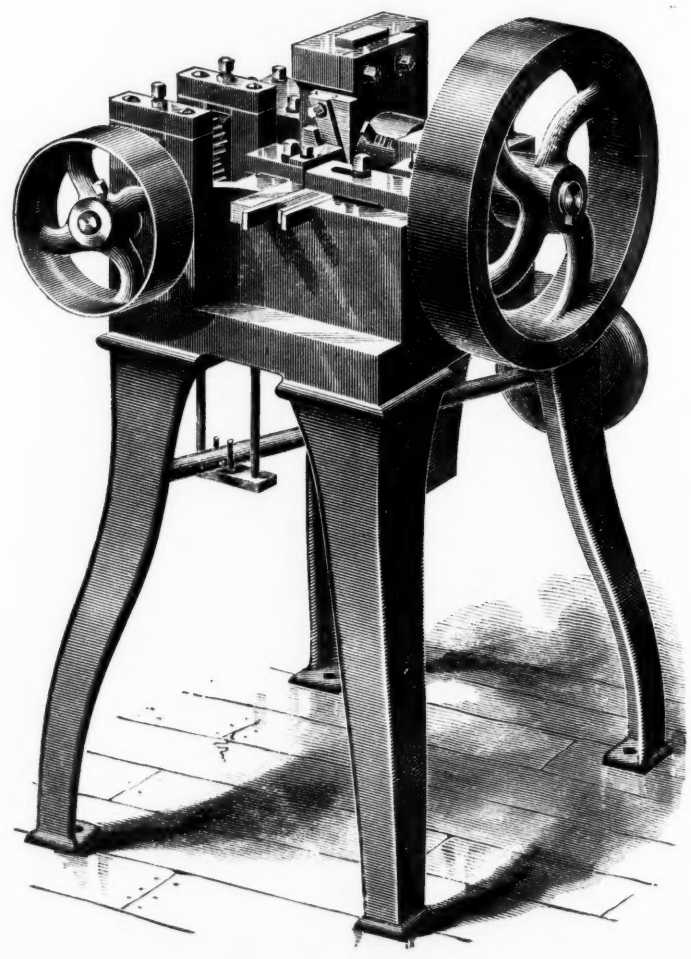
The first trial for 70 lbs. pressure shows three-fourths of a pound of resultant water more than the three subsequent trials, and one degree more of heat, which agrees with pre-supposed ideas on the subject. If we take the average weight of the resultant water in the three trials at 50 lbs., viz.: 77¾ lbs., or, in other words, it took 5¼ lbs. of steam at 50 lbs. steam pressure to displace the 72 lbs. of feed-water at 58°, 18 inches above the injector, and the average temperature of the resultant water was 125.66°. The resultant water at 60 lbs. pressure was 78¼ lbs., and the average temperature 130.66°, showing that it took 6¼ lbs. of steam at 60 lbs. to do what 5¼ lbs. of 50 lbs. pressure did; with this difference there is an increase of 5° of temperature in the resultant water in favor of 60 lbs. pressure. Take the average of resultant water at 70 lbs. steam pressure, viz.: 78.69 lbs. nearly, and temperature at 134¼°, we find it took $\frac{94}{100}$ths of a lb. of steam at 70 lbs. more than it did at 50 lbs., and $\frac{44}{100}$ths lbs. more that it did at 60 lbs; but the temperature is 8.59° higher than with 50 lbs. steam, and 3.59° above that of 60 lbs.

In the former article it was assumed that the boiler will evaporate 7 lbs. of water with 1 lb. of coal, costing $3.20 per ton of 2,240 lbs., or *one cent* for 7 lbs.; and as by the record it took 5¼ lbs. steam at 50 lbs. pressure to raise 72 lbs. of water 18 inches above injector, or a total lift of 49 inches; and by proportion 8 lbs. of steam *ought* to lift 100 lbs. water of like temperature to the same height, and the resultant water would be equal to 108 lbs., the temperature of which should be 125.66°, the cost would not be over $1\frac{31}{45}$ths mills, and by formula, in order to find the quantity of any given pressure necessary to heat a certain amount of water of a given temperature to the boiling point, viz.:

Let X = pounds of steam required.
T = given temperature of water.
W = Number of pounds of water.

$$X = \frac{(212 - T) \times W}{966 + (\text{temp of steam} - 212)}$$

$$9.00 = \frac{(212 - 125.66) \times 108)}{966 + (281 - 212)}$$



AUTOMATIC STAPLE-MAKING MACHINE.

From the above it will be seen that the boiler will furnish 9 lbs. of steam to bring the injector resultant water to the boiling point, requiring less than 2¼ lbs. coal to produce the 17 lbs. steam, making the whole cost 3¼ mills for the 117 lbs. of water at 212° operated on by 50 lbs. pressure.

By the same reasoning for the 60 lbs. pressure, it would take 8.68 lbs. of steam to displace 100 lbs. feed-water, and the result would be 108.68 lbs. of water at 130.6°, this being the average temperature of the three trials of 60 lbs. pressure, and would require about $1\frac{84}{100}$ths lbs. coal to produce it. By the formula it would require 8.45 lbs. of steam to raise 108.68 lbs. of water of 130.6° to a temperature of 212°, making the total amount of water 117.13 lbs. at a cost of 3¼ mills for $2\frac{45}{100}$ths lbs. coal operated on by 60 lbs. pressure.

For 70 lbs. pressure, if the first record is omitted, it will be seen that it required 6½ lbs. steam to displace the 72 lbs. feed, and the temperature of the resultant water was 134°, and would require 9.02 lbs. steam to displace 100 lbs. feed-water, making injector resultant 109.2 lbs., and to convert this quantity of 134° into 212°, according to our formula, it would take 8.60 lbs. of steam, and the total resultant water from both operations will be 117.62 lbs. for the 100 lbs. feed-water operated on by 70 lbs. pressure requiring $2\frac{52}{100}$ths lbs. coal at a cost of 3¼th mills.

From what has been said it would seem that the higher the steam pressure the greater the cost to produce water at the boiling temperature; this increase occurred at the time the feed water was passing through the injector, and not by the second operation, as shown by the record for each increase of boiler pressure more pounds of steam passed through the injector; and although with each increase of steam pressure the temperature of resultant water was greater, but not sufficiently so to decrease the cost of producing water of a higher temperature by a subsequent operation. So far as the experiments have gone, it shows that the injector, like other machines in general, will not increase production without a corresponding outlay.

As soon as sufficient investigations have been made, the subject will be referred to again.

Automatic Shear Point Staple Machine.

This machine is designed for making shear point fence and other staples, at the rate of 500 per minute. It is entirely automatic, taking the wire directly from the hank, cutting and completing the staple at one operation. With each machine is furnished a complete set of tools for making staples from 1 to 2½ inches long, from No. 7 to No. 15 wire. The machine can also be used for cutting wire off square for ordinary purposes, and also to a sharp point for fence barbs, &c. With each machine, tools for this purpose are also furnished. This novel machine is manufactured by the inventor, John Adt, New Haven, Conn., who also furnishes machines for making all sizes and lengths of shear point staples.

To Bore and Turn a Pulley Properly.

BY J. J. GRANT.

There are a great many different "special" lathes for boring and turning pulleys, that will do as much work as three or four common engine lathes, but as few shops can afford to own such a tool we will pass them by, and see how we can do it best with the old standby, the engine lathe.

For all pulleys above 12″ or 14″ in size, a face-plate is the best *chuck* you can have. A good assortment of hook-bolts is also a very necessary thing. They can be made of from ½″ to 1″ round iron, and of lengths from 4″ to 24,″ about 4 of each length.

These bolts are inexpensive and are invaluable in a jobbing shop, and in fact any machine shop, as they can be used for an endless variety of purposes besides chucking pulleys.

If you haven't a large face-plate don't be discouraged; take two pieces of plank about 6″ wide, 3″ thick, and as long as it will swing in your lathe, and half them together flatwise, making them in the form of a cross; now fasten this to the small face-plate, and turn out a place in the center ½″ deep, and of the exact diameter of the small face-plate. Drill four holes for ⅝″ bolts, and let the heads down into the wood far enough to allow of the cross being turned off several times. Now, with a tool in your tool-post, turn off the cross and you have a good substitute for the large iron face-plate.

When you remove the cross from the lathe, keep the bolts in, and save half an hour's looking for them when you are in a hurry. Now, having described the manner of making a "wood-chuck," we will proceed to clamp the pulley to the lathe for the purpose of chucking or boring out. If your pulley is large, place blocking on the ways of the lathe until the center of the pulley is as near the center of the lathe-spindle as you can see; then with the hook-bolts clamp it to the face-plates only tight enough to prevent it from slipping while being turned. Always have the bolts *outside* of the rim when the swing of the lathe will admit of so doing.

With a piece of crayon or chalk mark the

inside of the rim, and rap it until true. Time spent in this way is made up with interest, when it comes to balancing.

We will now consider the pulley as being ready to bore out; this is usually done by what is termed a flat-drill, and finished by either a fluted or a rose-reamer.

When an extra nice hole is wanted, a chip is run through with an inside boring-tool held in the tool-post of the lathe, and fed by the carriage.

This plan insures a hole of nearer the same diameter at each end of the hole than when flat-drills only are run through before the reamer.

When only flat drills are used, not less than two should be run through, one used as a roughing, and one as finishing. The finishing drill should be centered and turned of a diam. from $\frac{1}{100}$ to $\frac{1}{64}$ smaller than the reamer, according to the size.

A drill-rest made with a slot through which the drill passes is held firmly in the tool-post. An easy way to set the rest central, is to bring the lathe-center up to the rest, and raise or lower the tool-post until both sides of the slot is in contact with the center.

It will be found necessary when the core of the pulley is out of the center to hold the flat-drill with a wrench, to prevent it from moving in the rest until the body of the drill is in at least $\frac{1}{2}$"; by doing so with both drills it will generally be found true enough for the reamer. When the core is out so badly that a chip with the boring-tool is necessary, only the roughing-drill can be used.

In pulleys for main lines, or where it is necessary to remove them frequently, and providing they are held only by set-screws, a good plan is to bore the hole about $\frac{1}{64}$th" larger than the shaft; then, before turning, put in the set-screws, and turn on an arbor exactly the size of the shaft they are calculated for; this insures the pulley running true, and makes them easier to put on, or take off; of course, when pulleys are bored out in this manner it is necessary to throw them out of the center before boring about the same amount, as the size of the hole is larger than the shaft; put in the set-screws on the side that will true the pulley when on an arbor of the diameter, same size as the shaft they are to run on. The next operation is turning.

A pulley, whenever possible, should be driven for turning by the arms, with dogs or carriers bolted to the face-plate, as quicker and better work can be done than when driven by a common lathe dog from the arbor.

A diamond point tool should be used both for a roughing and finishing-cut, and should be rounded on the point so that the feed-marks can be ground out easier. Always take enough of a chip to clean the casting if possible, so that the second and last chip will be light to finish.

In turning pulleys crowning when there is no former, or taper attachment, it is of course necessary to set the tail-stock over. When turning crowning always commence in the center, as you will then prevent the possibility of the chip being too small to turn out, as the chip grows larger as you get to the outer edge. Always round the edges of pulleys to prevent the belt from cutting when thrown on or off.

When the pulley is finished turned, speed the lathe to the highest speed and grind the face with an emery-board made of pine, about 4" wide, 2" thick, and covered with leather on both sides, set this with 40 to 60 grade emery; a few minutes with this board will give finish enough for pulleys for main or counter-lines, or they may be filed, which should be done at a much slower speed.

All pulleys are more or less out of round as they come from the foundry, and of course are apt to be out of balance, and, after turning, should be tried in all cases, and balanced when necessary.

There is nothing more annoying to a man that is erecting machinery than to find, when shafting or machinery is set up and put into motion that the pulleys are out of balance. The blessings that are generally sent after the man that turned them would make his hair stand up if he should hear them.

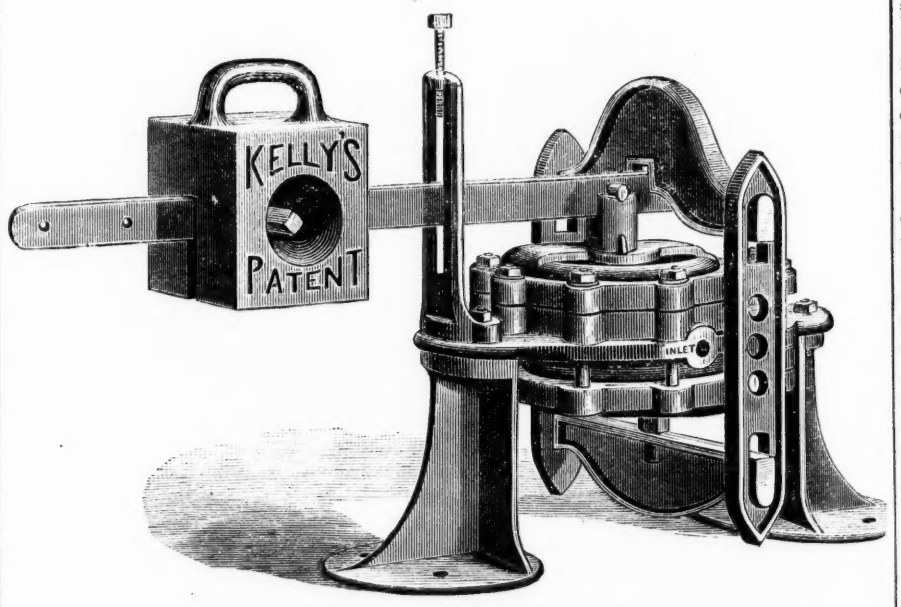
The best way to balance a pulley is the running balance, which is done by revolving the pulley at the same speed as it is calculated to run when on the machine, or shaft. The heavy side will, of course, throw out, and a mark with chalk will determine the place; then, if the pulley has a rib on the inside of the rim, a little chipped off will sometime do the business.

When there are no ribs there will have to be a piece riveted on to the rim; these pieces should be kept on hand, and should fit the inside of the pulley.

The running balance can not be applied in every case, and then the balance by straight edges, or parallel pieces, must be resorted to; these should be leveled *perfectly*, and an arbor without jams, or flat spots used. A piece of clay stuck on to the inside will serve to find the weight of balance required; these balance pieces should be riveted firmly and have no ragged edges to catch, or anything that may come in contact with them.

There are pulleys for different purposes that require different treatment; the above ideas are calculated for common line pulleys.

In conclusion, I will say to friend "Chordal" that I have had a great deal to do with milling machines, and in the short time I have been in the business they have grown from a thing almost as hard to find in a shop as hen's teeth, to be as common almost as a lathe, and especially in shops where work is made by duplicate; and if any thing that I can write for the AMERICAN MACHINIST will be of any value to any one, I shall be happy to do it, and will collect what information I can for a future issue.



KELLY'S IMPROVED DAMPER REGULATOR.

Kelly's Steam Damper Regulator.

No boiler should be without a good automatic damper regulator. It is as necessary to the proper running of a boiler as a governor is to a steam engine. The absolute necessity of a governor to control the working of an engine is universally admitted, and this control could not with safety or economy be entrusted to or be effected by hand. Now, if it is essential that the admission of steam to the engine be automatically regulated, is it not of equal importance that its generation be automatically regulated, in precise accordance with the demand? The engine governor can throttle or cut off the admission of steam to the engine when there is a sufficient supply in the boiler. But it cannot increase the supply of steam. It cannot open the damper. It is the office of the Damper Regulator to open and shut the damper at the proper time, and thus keep a uniform pressure in the boiler. It is therefore obvious that the boiler should have a governor of its own to regulate the air supply (and consequently the combustion) in direct proportion to the steam demand, and keep it at a constant pressure, and thus aid the engine governor in its work of economy.

By checking the draft in the flue, instead of opening the furnace door and leaving the damper wide open, as is often the case, and allowing the cold air to mingle with the gases in the furnace and to carry them up the chimney without being properly consumed, economy in fuel will undoubtedly be obtained.

Again, by checking the fire at the proper time, the overheating of the grate bars and the boiler plate is avoided, and frequent repairs rendered unnecessary. Explosions are prevented, from carrying too high pressure of steam, as the Regulator will close the damper and check the combustion in the furnace when the pressure in the boiler exceeds that at which the machine is set. It is claimed that Kelly's Damper Regulator here illustrated is perfectly reliable, and that when once set it will act as a check on the safety valve and steam gauge, and indicate when they are out of order. It is very simple in construction. There are two rubber diaphragms used, which are simply circular pieces of three-ply rubber packing of first-class quality, such as can be bought in any hardware store. They do not have to be "formed" in a mold, and as the motion of each diaphragm is very slight, there is but little liability to wear. In any event, it is but the work of a few minutes to replace them. The damper regulator is very sensitive, being made on the same principles as a scale beam, the pivots being of steel and "knife-edged." It is claimed to be more powerful than any other regulator of the same size, as, from its design, there is less loss by friction, and greater power can be obtained from the pressure of the steam in the boiler than from the mere weight of a fixed quantity of water, as is sometimes made use of. It is claimed that they are constructed in a strong, simple, durable, and workmanlike manner, and every one fully tested before leaving the works. They can be easily attached to any boiler. In the United States a patent has been allowed on the above improvement in steam damper regulators, and patents are pending in Great Britain, France and Germany. These damper regulators are manufactured solely by Wm. E. Kelly, New Brunswick, N J., who will give any further desired information.

Mr. Editor:

It seems a fair assumption that the series of articles, "Engineering Popularized," appearing from month to month in your journal, have for their object the education of the masses in the subject treated. Perhaps, all things considered, there is no better way for ignorant people to learn than by asking questions. I should like to avail myself of this ancient privilege. In the April number your correspondent strikes a hard blow at cylinder condensation and re-evaporation. It might be suggested to him that it would be highly interesting, as well as instructive to many of your readers, were he to amplify this subject. His array of figures are quite imposing, and figures are proverbially truth-telling, yet it would be at the very least interesting to know something more of the data which allows him to fix with such wonderful certainty the interior condensation of steam cylinders "under the ordinary working conditions!" What are the "ordinary working conditions," and how much is "about 20 lbs?" Engineering is supposed (by outsiders) to be a reasonably exact science. The Board of Engineers, with Mr. Isherwood at their head, thought differently from your correspondent, or at least the manner in which they expressed themselves in their report to the Government, the result of experiments supposed to be reasonably correct, would lead one to conclude they did. Many engineers who, in their experience with the indicator, find it necessary to supply from 25 to 50 per cent. more water to the boiler than the indicator accounts for, and that with tight connections and boilers above the suspicion of entraining more than the average amount of water, think differently. How shall we who are striving to learn get at the truth? Can this be accounted for by "leaky valves"? as your correspondent instructs us. If leaky steam valves were to draw such an amount of steam into the cylinder, would it not by super-heat tend to make the water account of the indicator and boiler supply more nearly balance? Is it not presumed that even your correspondent will tell us that an intelligent man in charge of a high pressure steam engine allows any very serious leak from the exhaust valves. We can all understand that leaky valves are not desirable, but I know that more than one of your readers have made the mistake of predicting too great saving by refitting. The result never seems to "square" with the expectation. It does not seem to be a very serious matter for the operative engineer to satisfy himself of the condition of the valves—so far as tightness is concerned, at any point in the stroke of the engine. While the diagram accompanying your correspondent's article is undoubtedly a good one, is his manner of determining the loss due to the "rounded corner" as "just the ratio of the little three-cornered area to the whole card" equally good? It is certainly a very simple solution, but is it correct? Bearing in mind the fact that the steam engine is supposed to accommodate itself to the work imposed upon it, as also that a fall in pressure previous to cut-off means a prolongation of the steam line, in order to satisfy the demand made by this work, would it not be correct to look for the loss in an increased terminal pressure—interviewing the diagram, for instance, just as your correspondent represents the collector interviewing the ticket agent? Besides, he expressly tells us we should balance all accounts with the coal supply in this way. Consistency, etc., you know! As to the proper point from which to draw the theoretical expansion curve, engineers of considerable ability are noticed to draw this curve from the end of the diagram, as that makes it best suited to the particular reference which they wish to make to it. Are they entirely wrong in doing so? and would it not be as easy, even on your correspondent's diagram, to determine the point of cut-off as that of release? Would it not be easier to do so on very many diagrams where the steam is expanded nearly, or quite, to the asmosphere? It is proper to acknowledge, however, that if high-pressure engines can be furnished users which will expand their steam on the "adiabatic curve every time," and which with so small a cylinder as 12" will return a H. P., as your correspondent asserts, for every 19 to 21 lbs. of water supplied to the boiler, there will not be a very rigid inquiry by the purchaser as to what particular point in the diagram the theoretic curve is drawn from. Will not some engine builders be surprised to learn that "a very reduced lap is necessary" in order to secure a sharp cut-off? Does this sentiment hold good for all classes of cut offs, or is it made because it fits some particular cut-off your correspondent has in his mind? Your correspondent asks a question, in effect, how long a mechanic would expect "to defend such a frontier against leakage," (that is, a valve of $\frac{3}{32}$" less), and then tells us it is the steam which cuts the valve and seat, and not the friction of the parts. Let me answer his question and ask another, or rather, let me put him in the

way of answering the question himself. There is, to my knowledge, an automatic engine fitted with balance poppet-valves, having the exact lap he mentions, $\frac{3}{32}$", that has been in constant use for 20 years. Now, when these valves are closed, that $\frac{3}{32}$" is all there is with which to "defend the frontier," and they have done this duty so well as to require no repairs in that time. I confess my inability to tell exactly how long they will continue to do so. In another instance, to my knowledge, a lap of $\frac{1}{16}$", on automatic drop slides, has perfectly fulfilled that duty for three years, with all evidence of continuing to do so indefinitely. So much by way of answer; now, for the question. In his observation of the cutting of slide valves, did he ever see one cut in any other direction than that of its travel? Undoubtedly in his experience he has seen some with very little lap at the ends of the ports? Did he ever see one in which the steam had cut a channel through either valve or seat in this direction? Some people are so obstinate they will continue to believe it is the friction of surfaces, assisted by impurities in the water, that causes slide-valves and their seats to become cut. I have been trying for years to learn something of the subject which your correspondent handles so readily, and should like to learn from him, as I acknowledge my ignorance. But first, I should like to know if what I shall learn is *correct*, as well as *popular*, engineering.

F. F. HEMENWAY,
Troy, N. Y.

Novel Bench Drill.

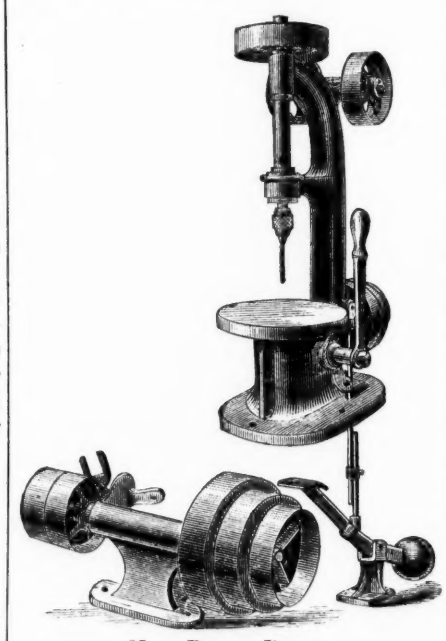
The cut herewith represents a new style of bench drill just brought out by the Pratt & Whitney Co., Hartford, Conn. It has a finished table nine inches in diameter with vertical movement by lever of $1\frac{3}{4}$ inches, and vertical adjustment of five inches. The spindle of steel is $1\frac{1}{16}$ inches in diameter. The core pulley has three grades for $1\frac{1}{4}$ inch belt. The greatest distance between drill-chuck and table is 5 inches. The machine is suitable for drilling $\frac{3}{4}$ inch and smaller holes; is furnished with drill-chuck and countershaft, and weighs, as prepared for shipment, 110 pounds.

Gleanings from the Foreign Press.

IRON TRADES EMPLOYERS' ASSOCIATION.

We find the following in the *Iron Trade Circular* (Ryland's) for June 7:

"In the seventh annual report of this association the Committee of Management state that the depression has, during the past year, been steadily on the increase, till it has reached a point which is felt acutely in every part of the kingdom. Information collected by the Committee shows that the stagnation applies alike to every branch of the engineering and machine trades, and that 30 per cent. of the skilled labor of those trades is at present unemployed, whilst the pressure of competition in finding work is so great that the undertakings of capitalists are in many instances profitless, and so unsatisfactory in their results that employers have been driven to consider the means by which the cost of production can be lowered to a basis which will make their trade remunerative. Under the above conditions an adjustment of the wages question has been forced upon employers in nearly every district in the kingdom. The movement has been taken up by employers who have acted together in their immediate localities, and reductions varying from 5 to $7\frac{1}{2}$ per cent., and in some cases even higher, have been quietly effected in every department of the iron trades in the following districts:—Barrow-in-Furnace, Barnsley, Bristol, Bath, Bradford, Halifax, Leeds, Huddersfield, Wakefield, Manchester, Bolton, Rochdale, Ashton, Hyde, Dunkinfield, Stalybridge and Oldham. In London, and in Liverpool and Birkenhead, many men are still on strike against a reduction in the rates of wages. The supply of labor is, however, so abundant that in spite of picketing and intimidation, the reductions will be carried in these as in the other district branches of the association. It will be remembered that at the last annual meeting the subject of the movements for the extension of working time was opened up in the report of the retiring Committee, and was fully discussed by the members present at the Hull meeting. It was expected that some important industrial and commercial organizations would join the members of this association in a general movement for a return to the number of working hours in force up to the establishment of the nine hours' system in 1862. The Committee still think the question is one which ought not to be lost sight of, as it must in the future be an important factor in any efforts to restore the stagnant trade of the country by reducing the cost of production, so that English employers may be able to meet their rivals in the open markets of the world. Information carefully collected in other countries during the past year, and circulated amongst the members of the association, has shown that whenever a general revival of trade occurs, they will be met by foreign competitors who can command an abundant supply of cheap labor, and whose cost of production is made still lower by the longer hours during which their tools and labor-saving machinery can be kept at work. If, therefore, the movement for placing English employers in a fair position to compete successfully has not yet been undertaken by any organized combination, it must not be assumed that it is abandoned.



NEW BENCH DRILL.

The increasing stagnation in the trade of the country will force the movement upon the public, alike in the interests of labor and capital, and it is certain that whenever the time arrives, free and unfettered workmen will rather elect to accept an increase in the number of working hours than submit to a much greater reduction in their wages. The experience of the past few months has given ample confirmation of this statement. In Huddersfield, in the shops of the members of this association, $57\frac{1}{2}$ hours are now adopted as the measure of a week's work. Our members in this district resolved not to wait any longer for a general movement amongst employers, and in January last they gave notice of their intention to increase the number of working hours. Great firmness and energy was required in the first stages of this experiment; all the unionist workmen struck against the proposal, but good non-unionist men were found ready to take the vacant places, and the patient endeavors of the Huddersfield masters have been successful. In Bradford, the members of the association decided, after the general meeting held in Leeds in January last, to give notice of their intention to fix $56\frac{1}{2}$ hours as the measure of a week's work. In this movement the employers were joined by the millowners, and therefore it was arranged to accept the time fixed by factory legislation. The unionist hands at once struck, but the supply of non-unionist workmen was fully equal to the wants of the district, and in all cases the new hands accepted work on the terms proposed.

With one exception, all the strikes during the past year at the works of our members have been against a reduction in wages or an extension of working time; and in every district where there has been a strike there has been the usual resort to picketing and intimidation.

The extension of the piece-work system in the iron trades has been, and must always continue to be, a matter of great moment to the members of this association. It is gratifying to be able to say that it is gaining ground in many establishments where its application has hitherto been retarded by the opposition of the trades' unions, or by the assumed difficulties of making it available for some classes of work. At no preceding time has it been possible to introduce the piece-work principle so easily as at present, because of the great and increasing quantity of unemployed skilled labor, and the fact that the able workman sees in piece-work the means by which he can be paid for his individual skill, and can thus compensate himself for such limitations to his earnings as have followed the reductions made in his weekly ratings and his working hours. As respects the special difficulties in the application of piece-work which the employer may have to encounter in some classes of work, it is being demonstrated that they are not so insuperable as managers and foremen have assumed them to be; with patience and equitable intention, they may, in many cases, be easily surmounted, and the advantages to all concerned make it a duty on the part of employers to introduce and extend the principle in their workshops."

BOILER INCRUSTATION.

A writer in the English *Mechanic* says: The best preparation to use for removing the scale, would, I think, be caustic soda. It would soften the scale and cause it to come off as a kind of mud, which could then be blown out, and it would not injure the boiler plates. The only said solvent which could be used is muriatic acid, but I consider the caustic soda far preferable. A few pounds of this might be introduced when the engine is not in use, say at the end of the week, and in a few hours the whole of the scale would come away, or it might require another application. Caustic soda will also prevent the scale from forming, and is certainly one of the most harmless chemicals that could be used for the purpose, but, in working at a high pressure, I cannot say whether it would be carried over. Even if it were, I do not see what harm it would do. A gelatinous substance, such as Irish moss, has a great effect in preventing scale deposit; at least, it prevents it from adhering to the boiler, which should be blown out whenever the mud accumulates. An engineer who had charge of boilers representing 250 nominal horse-power, once told me that he found cow's feet the best scale preventer, which amounts to the same thing as the Irish moss I have mentioned above, the action in each case being similar.

Imperfect Combustion.

A subject of unrivalled interest to all fuel users, and to inventors, is the imperfect combustion of the fuel used in steam generation and for other purposes, and which causes an annual loss of millions of dollars—a loss which no one gains, as where in a commercial transaction one man's loss enriches another by an equal amount.

There are very few fire-boxes in which combustion (which is simply rapid oxidation) is regular and complete; the proof being in the noticeably black smoke and the colorless unconsumed gases which escape from the chimney; the latter unsuspected, but readily determined by simple chemical experiments. The loss thus caused is startling when we compute it. Let any reader of these calculations look at his coal-bill, and his bank account, and see if the figures given here below do not interest him materially.

All oxidation is attended with a disengagement of heat. A given weight of pure carbon, which is the basis of ordinary fuel, gives out in burning (or oxidizing) completely, that is to say in changing to carbonic acid gas, CO_2., enough heat to raise the temperature of 7,170 times its own weight of water to one degree centipade (= $\frac{9}{5}$° Fahrenheit); or say 12,906 times its weight 1° Fah. In burning less completely, that is in forming carbonic oxide, CO., it would raise the temperature of only 1,386 times its weight of water 1° C. —say 2,495 times its weight, 1° Fah. It is hence to our interest and profit to burn the carbon thoroughly.

Debetté, from analyzing several examples of escaping chimney gases, gives their constituents the following proportionate volumes:

Carbonic acid gas	9.70
Carbonic oxide gas	0.74
Hydrogen gas	0.61

(We say nothing now of the other constituents.)

Taking the weights of these volumes of gases we find, say:

9.70 cubic meters of carbonic acid gas weighing	19.30	Kilograms.
0.74 cubic meters of carbonic oxide gas weighing	0.93	"
0.61 cubic meters of hydrogen gas weighing	0.05	"
In. 11.05 cubic meters of unburned gases.		
	20.28	"

Let us see how much heat has been wasted by incomplete combustion:

Carbonic acid gas contains about $\frac{3}{11}$ths its weight of pure carbon; and carbonic oxide is about $\frac{4}{7}$ths carbon. Then the 19.30 kilograms of carbonic acid gas contain 5.26 kilograms of carbon, which in burning have actually developed, according to a former paragraph, $5.26 \times 7170 = 37{,}714$ heat units. The 0.93 kilograms of carbonic *oxide* contain $\frac{4}{7}$ths of $0.93 = 0.40$ kilograms of carbon, which in burning thus incompletely have given off only $0.40 \times 1386 = 554$ heat units, instead of $0.40 \times 7170 = 2868$ heat units, which they would have given off had they been thoroughly burned to carbonic and gas. The 0.05 kilograms of free or unburned hydrogen ought to have been burned and have given off $0.05 \times 34{,}740 = 1737$ heat units. So that from the 20.28 kilograms of escaping gases we have got only $37{,}714 \times 554 = 38{,}268$ heat units instead of getting $37{,}714 \times 2868 \times 1737 = 42{,}319$; and thus we have lost by incomplete combustion 4051 heat units out of 42,319; or *nearly ten per cent.* of the power of the fuel.

Of the two combustible elements of coal, carbon and hydrogen, the former runs from 77 to 90 per cent, and the latter about five per cent. There is from four to sixteen per cent. of oxygen; the poorest coals having the least. The carbon combines with the oxygen of the air to form carbonic oxide or carbonic acid gas, according to the air supply; and the hydrogen gas in burning takes the oxygen, that is in the coal, and some more from the air, to form water; the quantity of the latter being a small item and hardly worth calculating.

There is twenty-one per cent. of oxygen in the air. Theoretically it takes nine (9) cubic meters of cold air to burn one kilogram of coal. Practically it takes eighteen.

Does it pay to introduce more air than enough to effect perfect combustion?

The chimney gases generally escape at a temperature of about 300° C (=540° Fah.); and as the specific heat of air (or its capacity for heat) is only $\frac{1}{4}$, one kilogram of air in being heated to 300° C takes up $\frac{1}{4}$ of 300=75 heat units.

If each kilogram of coal gets eighteen cubic meters of air weighing 23.4 kilograms, of which air is only one half, or 11.7 kilograms, were needed, we waste $11.7 \times 75 = 877.5$ heat units in heating this extra and unneeded quantity of air. The coal gives out 7,500 heat units, of which the 877.5, or about *twelve per cent.* are wasted by excess of air-supply.

We can prove this figure to be correct, by another means. Debette's analysis of the

waste gases of a coal fire show 10.26 per cent. of oxygen gas, and 78.68 per cent. of nitrogen. As the entering air is one-fifth oxygen and four fifths nitrogen, we may say that 100 cubic meters of the analyzed gases contain 50 cubic meters of air, of which 40 cubic meters are nitrogen. There is in these escaping gases 9.70 cubic meters of carbonic acid gas; 0.74 cubic meters of carbonic oxide, and 0.61 cubic meters of hydrogen; the heat given out by the combustion of the carbon in the first two being 38268 heat units. Now if the 50 cubic meters of unnecessary air-supply, weighing 65 kilograms, escape at a temperature of 390° C, there has been, in heating this air, a loss of $65 \times 75 = 4875$ heat units, which is twelve per cent. of the 40.003 heat units which we ought to have had if we had not wasted the heat of combustion in warming up this unused air. These figures thus prove the preceding ones, and show the loss by excess of air-supply, to be twelve per cent.

This loss is, we must remember, in addition to the ten per cent. loss from imperfect combustion. The total loss from excess of air and imperfect combustion is then $12 \times 10 = 22$ per cent.

Taking seven of Debettés analyses we have the following figures:

No. of analysis	Proportion of surplus air.	Loss of heat by excess of air.	Loss of heat by imperfect combustion.	Total loss of heat.
1	37 %	10 %	24 %	34 %
2	32 %	9 %	8 %	14 %
3	22 %	9 %	11 %	20 %
4	59 %	12.5%	2.5%	15 %
5	53 %	16.6%	0.7%	17 %
6	73 %	19 %	15 %	34 %
7	75 %	22 %	17 %	39 %

If we leave out the results of the first analysis (in which the quantity of carbonic oxide was $\frac{1}{5}$d the quantity of carbonic acid) we see that *the total loss of heat is about the same, as long as the excess of air ranges between $\frac{3}{10}$ths and $\frac{6}{10}$ths of the total volume; and that it increases when the excess of air reaches $\frac{3}{4}$ths the total volume.*

The moral is, *keep an eye on the draft.*

New Boring Tool.

We illustrate herewith, a new design of an adjustable inside lathe tool, designed and used by W. S. Harris, of Croton Falls, N. Y. for turning out small holes or cutting internal threads.

Mr. Harris says, "I find it the best thing that I have ever used or seen. It works like a charm on small work, such as a jeweler has to perform. The tools for this kind of work are not easy to forge from steel the size for the tool post, and are easily broken when made small. This tool stands well and is easy to make."

Referring to the cut, Figs. 1 and 2 represent two pieces of steel with V grooves cut in them as shown by O and A, Fig. 2 (end view).

The tool 3 is made of round steel, and can be set out or in at pleasure. It can also be turned to raise or lower the point, an advantage not found in any other tool for this purpose.

This device is not patented, and by the courtesy of Mr. Harris is here presented for the benefit of any of our readers who may desire to use it.

Extracts from Chordal's Letters.

Mr. Editor:—In my very first letter to you last year I gave you a single strain from Sackett's song, about the man who wanted changes made in a machine which Sackett had made for years, and which the man had never seen. Dividing boxes of running journals was the burden of the song. Now I am made to sing myself. I designed an iron-working machine for the Tubal works some years ago. They sold a hundred of them, and this week they send me a letter from a prospective purchaser who is horrified to find, by inspecting one in a neighboring city, that sundry shafts of the machine run in boxes bored from the solid, and having no caps to take up wear. My only reply to my old patrons is to clip Sackett's music from an old AMERICAN MACHINIST, and enclose it to them. The business policy of altering satisfactory details to suit the premature desire of a customer is a thing discussed in the letter referred to, and I am now disposed to express my views on the box question, and call for the opinion of others. I will illustrate my sermon by assuming that I am called upon to design and construct a grindstone frame, and that circumstances, over which I have no control, force me to construct the frame of green timber. While scheming upon the parts, I arrive at the journal boxes. What shall they be made of, and shall they have adjustable caps? First, as to the material. I know that a cast iron box bored out is the cheapest, and I know that the steel shaft will run in the cast iron box, and outwear ten babbited ones.

But I know the latter to hold good only so long as the shaft has a fair bearing in the box, and I know that Hank or Chris or Jim, or Bill, in building the rig, will not get the boxes in line, but will quit the job as soon as he can turn the shaft in the boxes; and I also know that if the boxes were in perfect line they would only stay so as long as the green wood frame allowed them to. Furthermore, I know that a catacornered cast iron box will cut the shaft and ruin it. If there is going to be any damage done I want it done to the boxes, because they are cheaper to replace than the shaft. I am constrained to abandon

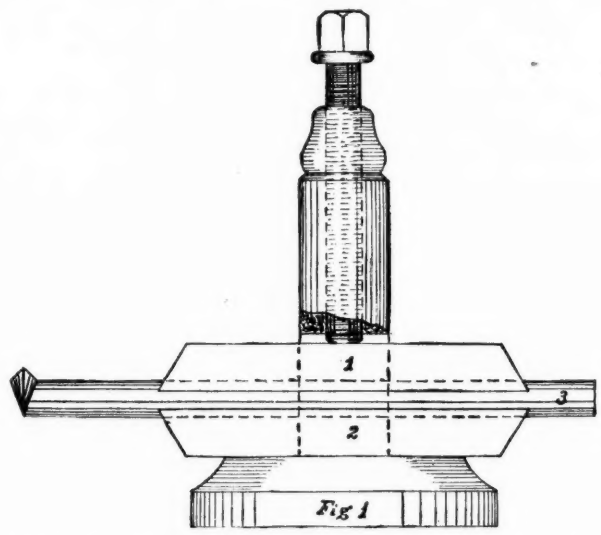


Fig 1

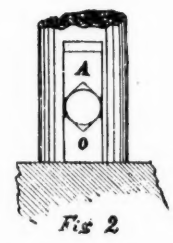


Fig 2

cast iron for the boxes and substitute a babbited box. I now say that, under equally favorable circumstances, the babbit boxes will have to be rebuilt ten times as often as the cast iron, but that under unfavorable circumstances, known to exist, the shaft will last longer than with cast iron boxes, and that the boxes stand an equal chance of life. I am forced by circumstances to use babbit on account of its yielding, accommodating nature. Having decided upon babbiting the boxes, I quickly decide to put caps to the boxes for two reasons. First, they are easier to babbit; and, second, they allow the stone to be lifted out. I never dream of using these caps to make the boxes wear longer.

My grindstone has thus got babbited boxes with caps and, as in the present case, fitly associated with a green oak frame.

So much for circumstances beyond my control. But suppose I am at liberty to control these circumstances myself, or that a cast iron frame in one piece is called for. I see fit to bolt the boxes down to seats on the frame casting. Shall I use the same boxes I used on the oak frame? I study over it. I went to the expense of babbit boxes on the oak frame in order to guard against bad setting and inevitable shrinking. On account of this durability I want the cast iron boxes if they are equal in other particulars.

First, I will see about the setting. If I leave the work to Hank's judgment he will choose between two plans.

He will bore the cast iron boxes and accurately dress their bottoms, then he will dress the seats and line up the boxes, only he won't. He will do just as he did with the oak frame, and leave the boxes as soon as he can turn the shaft, then they will not be in good trim, and will cut the shaft, and my reputation as a designer of grindstone mountings will collapse. Hank has a second chance. He will bolt the boxes down haphazzard, but rigidly, and bore them together. By the other plan he did two accurate, or nice pieces of work and made a bad job, while this way he does no skillful work and makes a good job. Of the two plans the last is fully fifty per cent cheaper, and my reputation still stands a chance. Desiring cast iron boxes can I object to them now? They are in line for they were bored at once, and they can't get out of line for they can't be bolted down out of line; they are not only in line, but awkwardness cannot get them out of line. I feel satisfied that all the objections existing against iron boxes on the oak frame disappear in the present case. I have a shaft with a good bearing in iron boxes, and the bearing will remain good, and the boxes will remain cast iron. In the case of babbit boxes the babbit soon wore down, and exposed the cast iron ledges at the ends of the boxes. These soon cut into the shaft, unfit it for a new babbit box, or any other kind of a box.

I am satisfied that in the present case the material of my boxes is all right.

In the oak frame case there were bad conditions, and babbit had to be used with regret. In the present case the conditions are happy ones, and cast iron is to be used with satisfaction.

Now about the caps. Caps or no caps, that is the question. Why did I cap the other boxes? To take up wear? Not a bit of it. Why not? Simply because I don't care to take up the wear. The stone would run all right in half boxes if the half always came in the right place. The weight of the stone is down, and the pull of the belt is or may be up, and the belt-pull may preponderate over the weight, so I desire the shaft to find a bearing which ever way it may go. The grindstone ain't a reciprocating machine, and slack in the box is a benefit rather than a damage, for it is evidence that the cap is not acting as a friction brake to consume power and wear the shaft. I capped the other boxes for convenience in babbiting and in lifting the stone out. I don't babbit these boxes, so that part of the "why" is settled. As for lifting the stone out the boxes may come with the shaft. With the old rig this would not have been permissible, because the boxes were delicately located in place, and if removed would have to be skillfully replaced. Now, however, I find that the boxes cannot be placed wrong, and that they may come off with the shaft. This looks as though I desired boxes without caps, and that I was not seeking reasons for and against them. This is true. When discussing the material of the box I was urged to use cast iron on account of its durability, and was compelled to forego it for other reasons. Now I desire to have the box without caps for the sake of durability, and will certainly forego solid boxes if reason dictate the use of caps. Solid boxes are more durable than capped boxes, for the simple reason that if made to fit they will stay fit, while if caps are used some smart Aleck will be forever and eternally adjusting them, and they will never by any circumstance of good luck fit right. He will screw the caps down and wear my boxes out in a year. I want them to last and I insure them doing so by simply putting it out of the power of officiousness to defeat me.

Some men have a passion for putting a cap on a box without regard to whether the box is subjected to jumping wear or to steady uniform rotary wear.

This is my law based on experience:

For simple revolving journals on light or heavy work a box without a cap will outwear six boxes with caps. This outwear assertion refers to shaft and box alike. Memorandum: There are a hundred geniuses in the country trying to invent a loose pulley adjustable for wear. When they succeed in doing so, loose pulleys with proper length of hub will wear out, and not till then. There is a difference between "cut" and "wear." Tightening a cut journal will ruin it. No man ever saw a cone fit on a lathe worn out, during the lifetime of a lathe. Fortunately there is no way of taking up wear on them. No man ever saw a lead screw bearing on a lathe worn out unless it had caps, in which case he never saw it in shape. An upright drill spindle running in a something which can be tightened is never in good trim, its always tight or loose. If the same spindle runs in a solid something it is never tight or loose. It is just right, and will stay so as long as the other organs of the machine last.

One more reference as to adjutability. I will make lathe boxes the subject a homily some day, but I wish now to call attention to the well-known fact that if a lathesman is silly enough to have filed his boxes open, he will be screwing at them twenty times a day, and his boxes are never right. If he has the joint come metal to metal he never gives them a thought from week to week, and they are always right. If his works chatters he never grabs his tool wrench and goes fooling round the spindle boxes, for he knows the trouble is somewhere else.

* * * * * * The last time I was in Centertown, Hill took me through his paper mill. He has a nice Wright engine in one part of the mill, and Hill called my attention to the lubricator. It was large and complicated enough to serve as a monument for the discovery of perpetual motion. I was in doubt as to whether it was attached to the engine or the engine attached to it.

I didn't understand its principle and never want to. Hill pointed to it proudly. Says he, "I have got the oiling business reduced to a practical science now. When I got this engine I found that lubrication was important. I got the best lubricator offered; it failed. I got another; it failed, and so on for a dozen or more different kinds. Finally, I got this. Paid forty dollars for it, but its a good one. I attend to it myself and have no trouble. I save oil and can get uniform and perfect lubrication in the valves and cylinder." I took this all in and said nothing. I have seen men like Hill, and oilers like his before. It is no better than any other oiler, but simply happened to be the lucky one to be on the engine when Hill had got his skill whetted up to a fine edge.

With his present skill the very first and simplest lubricator he had would give him perfect satisfaction.

Hill has simply been to school. Two years was the time, and two hundred dollars worth of fancy lubricators was the apparatus of his class.

The object of a cylinder oiler is to let oil into a steam space without letting the steam out, and to put the oil inside the cylinder instead of outside of it. The very simplest contrivances in the market will do all this as well as the marvelous productions of the last five years. Some of these things are as delicate as a fly's tongue and are just about as essential around an engine. The more beautiful they are in principle, and the more perfectly constructed, the more useless they are for the purpose specified. There is no trouble in properly oiling a cylinder, etc., with a common lubricator, but no man who fails to take Hill's degree of Doctor of Lubrication can get satisfaction out of the ingenious uncommon ones. Engines have run for years, and thousands of them run to-day, without any lubricator at all or any

way of getting oil to the inside, but I very much doubt the possibility of an engine running right with one of these perplexing lubricators, if the engineer is not schooled in the intricate art.

Very respectfully,
CHORDAL.

Correct Engine Duty.

Editor American Machinist:

My article on "Calculated *vs.* Actual Engine Duty," in January number of MACHINIST, forms the subject in the April number for some remarks on the performance of the two engines that I used to illustrate the idea I wished to convey, viz.: that the analysis of an indicator diagram does not always tell the whole truth about an engine.

I used the Hope Station Pawtucket Engines in illustration for several reasons. In the first place it was my fate to be employed by the City of Providence and the builders of the engines, jointly, during the "experts trial" of the Hope Station Engine, and I met you for the first time during the trial of the Pawtucket Engine, so you have evidence that I was there also.

The trial of the Hope Station Engine extended over several weeks, and an excellent opportunity was presented to become familiar with all the facts of this noted trial. I have never as yet seen an unbiased account of the details of this trial in print, and think if such an account was published it would tend to set the builders of the engine, and the experts that made the trial, in a more favorable light before the world. However, I do not propose writing such an account of said trial, but simply to say that the Hope Station Engine was not built for high duty. It was built for a *high service* engine, and has performed the specific service for which it was designed admirably for several years; and so far as I am informed, continues to do so to the entire satisfaction of the citizens of Providence. As to the method adopted by the experts, Messrs. Smith, Graff & Reynolds, in making the trial, there is a diversity of opinion among engineers, some of whom attempt to criticise without being acquainted with all the facts. Among other objections, it has frequently been stated that "they took no indicator diagrams." Fortunately I am in a position to correct that error, as I was employed for that special purpose, and took several hundred diagrams from both steam and water cylinders; and although the experts did not publish them with their report, yet these diagrams aided materially in the conclusions reached.

Fac similes of the diagrams taken from steam cylinders of the Hope Station Engine are, however, published by Mr. Chas. T. Porter, in his excellent work on "The Steam Engine Indicator," and from which a valuable lesson may be deduced.

Mr. Porter in writing of these engines, says: * * * "The cylinders were all indicated at each end, and diagrams similar to these [five diagrams shown] were everywhere obtained. It appears that the duty of these engines, when making .866 of a revolution per minute, was 8,487,370 foot-pounds, with the consumption of 100 lbs. of coal; and that when making 10.167 revolutions per minute, it was 25,865,740 foot-pounds, with the consumption of 100 lbs. coal. At its usual speed of about 50 revolutions per minute, with from 5 to 7 feet stroke, giving a piston speed of from 500 to 700 feet per minute, this type of engine unjacketed has been regarded as quite economical; but at the above speeds, the same engine in perfect condition, and with the employment of all the mechanical means so much relied upon to produce economy, gives, at .866 of a revolution per minute, only one-twelfth of the duty attained in the best pumping engines, which duty is increased three-fold by the mere increase of its speed to 10.167 revolutions per minute."

The question that presents itself is, what is the cause of the remarkable difference in duty of the Hope Station Engine, built by the Corliss Steam Engine Company, and the Pawtucket Corliss Pumping Engine?

From the quotation as above we learn that "the mere increase of piston speed increases the duty three-fold;" but will the increase of piston speed from 61′ per minute in the Hope Station Engine to 258.2′ per minute in the Pawtucket Engine alone account for the difference in duty? We should say not. In the Hope Station Engine the cylinders were not steam jacketed (but were well protected from external radiation), while the steam cylinders of the Pawtucket Engine are steam-jacketed. Is it the use of the steam jacket alone that gives the great increase of duty? or is it the use of the compound principle, or the higher steam pressure, or the Centennial valve gear," or the "two upright walking beams," or, in fact, any of the special features of the Pawtucket Engine that alone gives it such a remarkable increase of duty?

From the record of these two engines, many an illustration of pet theories can be drawn if desired. Our friend Church might get an illustration of the value of his high piston speed; some one else can argue the efficacy of the steam jacket, while still another might show the practical value of the compound principle, etc., etc.; but to the writer's mind the lesson is that in engine building, as in all other business, a careful attention to the most minute details is necessary to secure the best attainable results.

This is shown in an impressive manner in the construction of the Pawtucket Engine; and for the benefit of your numerous readers who have not the opportunity of seeing for themselves, I hope you, Mr. Editor, will give us all the minute details of the construction and operation of these two engines, as I think it will justify my previous position, that the indicator card alone does not give sufficient data from which to calculate the duty of an engine. I contend that an engineer might as well try to calculate the amount of stomach-ache contained per cubic inch of a green cucumber, as to try to prove an engine perfect in all particulars by the simple exhibition of an indicator diagram.

W. H. ODELL.

YONKERS, May, 1879.

The Indicator Diagram Defended.

Mr. Editor:

Under the heading, "The Indicator Diagram: Is it in many instances a fraud?" I find in your number for May, some remarks by our friend, Mr. Roper.

It is a saying that in Philadelphia they accept a stranger as honest until they discover him a rogue; which, I suppose, follows in most instances sooner or later.

Possibly Mr. R. has had some of the usual Quaker City experience, or imagines that he has, which is all the same to him; and consequently feels it his duty to give the engineering world, through your royally good paper, the benefit, and the subject, as he expressed it, a "shake." Now, Mr. R., how can you use those naughty, unmechanical expressions?

I wish to say a few words on the above subject myself, and as you are kind enough to invite correspondence from the mechanic and engineer, I am qualified, by the fact of being one, and count myself in, and with your kind permission will proceed at once to say what I have to say.

I interpret Mr. R. as saying, that, owing to the high price of indicators, the knowledge of the value of its diagrams is confined to few, or words to that effect; why not the many? The high price don't seem to interfere in the case of lager, tobacco, good clothes, hair-oil, and patent-leather boots; and who more generously supply themselves than engineers? and who among them could not buy an indicator if he wanted it badly enough, and thought he must have it, as he thinks he must have some other things?

The fact is, that if indicators were given away the valuable knowledge Mr. R. speaks of, would still be confined to few, notwithstanding Mr. Church's effort in "Engineering Popularized," and to which I find no exception—by the way.

I am sure that the possession of an indicator by every engineer in the land would not make the "rank and file" better acquainted with, or even incite their ambition to become posted in its principles, or become a whit more competent to care for their respective boilers and engines. The truth is, Mr. R. puts the cart before the horse, and I can safely say, without fear of contradiction, that where an engineer has had ambition enough to become interested and study up these and kindred subjects pertaining to his business, you will find that such a man has an indicator, or the frequent use of one, and that he uses it for the purpose of adding to his stock of information, and as a step towards his own advancement, and not for the sake of his employer's praise.

The indicator is not an instrument to "show off" with and "hitch" on to the engine to dazzle your denser neighbors, who, with open eye and thumping bosoms listen to the profoundly great "I am" who talks of "Marryatt's" curve, and tells them that their diagram has been doctored; such men derive the motion for driving the paper drum of the indicator from anywhere! oh, anywhere! from one of the valve stems, for instance,—it makes no matter so long as it goes back and forth, and is actuated from the engine.

How to use the indicator and to understand and apply the valuable information, calls for the highest skill in the business, and few operating engineers, outside of some of the larger powers, have even learned its a b c. I am sorry to say the majority fail, not only in this particular, but also in things essential and of practical daily application. I feel very much like giving such subjects a "shake," and ask them to wake up, and learn things as they really are. "Well," they will say, "I can't stand study and reading; somehow or other, I can't apply myself; it hurts my head and affects my eyes, and I haven't got time; I intend to begin some day, though. But they never do, and they grow more pig-headed and prejudiced, and, if they only knew it, prouder of what little they have picked up by application, perhaps, some time in the "long while ago."

About doctoring and tinkering with indicator diagrams, I have handled a great many from different automatic cut-off engines of prominent builders, and can answer that they have not been doctored, and I saw them taken with my own eyes, and many were fine ones. However, I do not say that it is not done by some.

I have, however, seen cards that were intended for publication, where certain corners and lines that were sharp, true, and distinct, were toned down a little, the excuse for not publishing them, as they came from the indicator, being that engineers will say they have been doctored.

I do not doubt the peculiar skill that is inherent with some men, or is the result of large experience and study in the designing of automatic cut-off and other engines, and in watching them closely while in practical operation, correcting one weak point after another; the indicator diagram being their guide in improving upon and finally perfecting their respective engines. At the same time these men are "the few" who are aware of and appreciate the value of the indicator-diagram. They have also learned how to use the indicator, how to take care of it, to detect and correct its errors, and keep it in order.

And here a word about indicators. Those of to day are no better than they should be, and if the market price is the limit of accuracy and fitness for purpose intended, let them raise the price instead of lowering it, if they can afford thereby to give us a better and more reliable instrument.

Such men as Corliss, Brown, Wright, Babcock and the Buckeye Co., I am certain, never doctor their cards. They have no occasion to; their experience and knowledge of the principles of their business in all its features enable them to produce an engine which, under certain load limits, will burn just so much fuel per h. p., and, with proper adjustment, produce just such diagrams as will give the constructor thereof the credit, among a certain class who know no better, of having doctored their cards.

Strange, that to build an engine that will produce a good indicator diagram should be a matter of so much uncertainty, and that it is not the objective point from the start, in so far as it is conducive to maintenance of the machine and good economy. It is not so always, Mr. R. We find some good examples in engineering abroad, and we need not look so far from home to find instances where the template has been made first and the identical reality followed, in due time, as near alike as "two peas in a pod"

Mr. R. is in error when he quotes the case of two prominent engine builders at the Mechanics' Fair in Boston, 1878. I happen to know that there was no tinkering; neither was there any occasion for accusation, as the parties saw taken and secured from each others' engines cards as they came from the instruments both on this and other occasions.

May this rivalry among engine builders continue, and may each have his expert or experts, if they are of any use whatever in helping them build a good engine, and in placing it before the public. I would be mistaken from what I know if Mr R. himself refused, for a fair compensation, to assist in the good work, even if it amounts to no more than copying a circular for them. May the engine constructor that does not use the indicator to improve his own machine and make it (the use of good material and good workmanship excluded) what it ought to be, go out of business, or, as the "boys' say, be "fired out." Such as these doctor their cards, *and no others. No reputable and first-class engine builder will stoop to such tricks.*

In closing my remarks, which, I am afraid, on first acquaintance, I have extended too far, I would say that it is my belief that there are a number of first class automatic cut-off engines built in this country of ours, where, to those that understand their business, adjustments are provided that can be made so "fine and accurate" that those beautiful productions that have excited the suspicions of Mr. Roper can be and are realized.

MONS. YENNEPE.

New Wood Working Machine.

We have received some specimens of work produced by Boult's carving, paneling, molding, and dovetailing machine, for the manufacture of furniture, carriages, cars, pianos, organs, churches, dwellings, stairs, desks, coffins, chairs, washing-machines, cigar molds, brushes, and all other kinds of wood-work.

This machine is believed to be the most simple, useful, and cheap machine ever produced for general wood-work.

An objection is often advanced that machines adapted to an extended variety of work must be more or less complicated—the changes difficult and tedious, and the adjustment troublesome. This machine consists of an arrangement so simple that not five minutes time is necessary to effect the most radical change in its capacity. The operator is surprised at the amount and the variety of work he is able to accomplish with so little change of the parts.

The machine is particularly recommended for its general application to wood-work, and freedom from traps and useless appendages. Its merits have been extensively and warmly recognized both in America and in Europe. Work in carving and paneling which has heretofore been done by hand, is done in a superior manner by this machine.

We have also received an illustrated catalogue of 32 pages, describing this and other machines which are manufactured by the Battle Creek Machinery Co, Battle Creek, Michigan.

A RESULT OF THE CENTENNIAL.—Three years ago a Philadelphia engine-building firm had not a single customer outside of the United States. Within the last year, however, it has filled orders for India, Germany, France, England, and Australia, and its export trade is attaining such dimensions that a large manufactory in the interior of the State is kept exclusively at work on foreign orders.

A New Feed-Water Filter.

The difficulties in filtering impure water for steam boilers are caused mainly by the clogging up of the apparatus used for the purpose. Almost any filter in the market will work satisfactorily for a short time, but it always has been a knotty problem in engineering to construct one that can be operated satisfactorily month after month without causing an interminable bother to keep it in working order. The Babcock & Wilcox patent filter, which is here illustrated, consists essentially of two vessels both filled with filtering material, which may be, and generally is, of different qualities and fineness. The water is fed into the bottom of one, rises upward through the contents, depositing the greater part of the impurities in the lower portion of the same. From this vessel it passes into the top of the second vessel, and descends through the fine filtering material therein, to a chamber beneath, whence it passes to the boiler or tank. The first vessel may be cleansed by a reverse current of water passing through it alone, but a steam pipe direct from the boiler, which blows out the water therein, together with the gathered impurities, through a mud-valve provided for the purpose is much to be preferred. As this first vessel intercepts the greater part of the impurities in the water, which can thus be quickly cleansed as often as necessary, the second vessel receives only comparatively pure water, and does not require frequent attention. When it does, however, the simple removal of one or two inches of the surface material, through hand holes provided for that purpose, prepares it for another period of maximum activity. The filter is located between the feed pumps and the boiler, and the water is filtered under pressure. A pressure gauge, indicating the difference in head required to force the water through, or the resistance offered by the filter, is a constant monitor to tell when it needs cleansing.

The first chamber is usually filled with coke in varying degrees of fineness, the finer on top, with some inches of animal charcoal, which is kept from rising by a layer of asbestos fiber and a grating. The second is filled with animal charcoal of a proper fineness, resting on a grating covered by a blanket, at the bottom. There is sufficient of this charcoal, so that the surface may be removed a number of times without requiring a renewal of material, and it is only after a long time, and the exhaustion of nearly all this charcoal, that a new charge will be required. The coke in the first chamber is so inexpensive that it may be renewed as often as necessary ; but even this, it is claimed, will rarely be required oftener than once in three months.

When the renewal of the charge in either chamber is necessary, by the removal of bonnets at the bottom of the chambers, the whole contents may be allowed to fall into the drip-pan, which forms the base, from which it is readily removed. The bonnets with the gratings, are then replaced, and the new charge supplied from above.

The feed water enters at B, and escapes at A. C is a pass over valve, for use when it is necessary or desirable to allow the water to pass directly to the boilers or tank. D is the mud-valve, and the steam valve is shown at the top

A safety valve in the feed pipe prevents undue pressure, and a thermometer shows the temperature of the feed. Small cocks are also provided to sample the water, both before and after filtration.

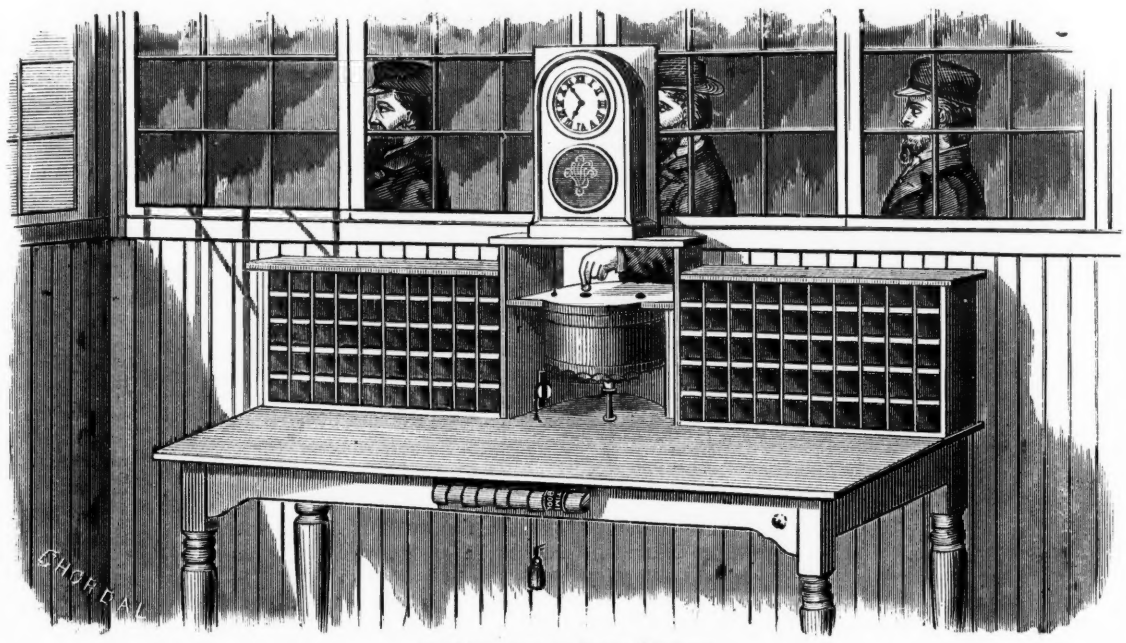
The whole is substantially built, of neat design, and is applicable to a variety of purposes where pure water is required, as well as for boiler feeding.

For further particulars, address the manufacturers, Babcock & Wilcox, 30 Courtlandt St., New York.

NEW FEED WATER FILTER.

Wm. Sellers & Co., have been sending machinery to Australia several times during the last six months. They have some good customers there. An exhibit of their machinery will be made at the Sydney Exhibition next fall.

The proposed World's Fair in New York, can safely be put down as a fixed fact. The Governors of several States have appointed delegates to attend the convention to aid in organizing the exhibition, and preparations will soon be begun in earnest.



A MECHANICAL TIME-KEEPER.

A Mechanical Time-Keeper.

Mr. Editor.

As promised you some time since, I send an illustration of the time-keeping machine which I showed you in Sackett's shop. This device is the invention of Mr. A. S. Kirk, of Schofield's Iron Works, Macon, Georgia. Whether the thing is to be recommended or not, it is certainly an excellent illustration of one way of doing things. The machine is intended to save labor in time keeping, but has no reference to detail time keeping on work. As shown in the illustration, it consists of a time-keeper's desk, and furnishes him a place for the performance of his work, and for the deposit of his pay books, &c. It is placed against the wall past which all workmen must go as they arrive and depart. There is a hole in the wall exposing two slots in the deck of the machine. Underneath this deck is a compartment box intermittently revolved by clock-work. One of the slots in the deck is called the commencing slot, and the other the quitting slot. When a workman is hired he is given a number of brass checks, all having the same number stamped upon them. This number is the book number of that man as long as he stays in the shop. By this number he is carried on all the books, and by this number he gives tool room receipts, &c.

The time book to be used with this machine is gotten up as follows, the first vertical column being for the workman's number.

No.	M	T	W	T	F	S	Total.
13	11	5					
	7	2					
	4	3					7
14	12						
	8						
	4						4
15	11	5					
	7	2					
	4	3					7

Without entering into any description of the mechanical details of the device, I will simply refer to its plan of operations, and to the plan of booking its work.

We will assume that the machine is being used in a shop working ten hours, and keeping time by the hour. The cylinder shown in the illustration has twelve compartments, or pockets near the outer edge, and twelve more just inside the circle of the first twelve. The deck covers all these pockets, and the commencing slot is always over one outside pocket, and the quitting slot over one inside pocket; there is a coiled spring under the desk which tends to revolve the cylinder. A pawl hooking into notches upon the cylinder, prevents rotation. This pawl is attached to the works of a calendar clock in such a manner that every hour the pawl will lift and allow the cylinder to turn one notch.

At six in the morning the cylinder is in such a position that checks dropped into the commencing slot will fall into what we may call the seven o'clock pocket. The cylinder stands this way for an hour, or till two minutes after seven, at which time the cylinder brings the eight o'clock pocket under the commencing slot, and the seven o'clock pocket under the quitting slot. In an hour it changes again. The slots thus remain an hour over each pocket. A workman may deposit his commencing check any time within the hour before going to work, and has two minutes margin to go on after time is up, and he has an hour in which to deposit quitting checks. The machine has adjustments which allow the intervals to be set to suit the rules of the shop.

The time-keeper, when he gets down to work, revolves the cylinder by hand, and pulls drawers out of the bottom showing the checks in the properly-labled pockets. He takes the checks from the eleven o'clock quitting pocket, for instance, and finds checks Nos. 13 and 15. It is Monday, and he finds his time-book, as shown above, ruled for morning and afternoon of each day. He jots down 11 for Nos. 13 and 15, and so on.

When he empties the seven o'clock commencing pocket he finds Nos. 13 and 15 there. He puts 7 under the quitting figure already noted. Afternoon the same. He subtracts commencing figures from quitting and gets the hour's time. The horizontal row of remainders at the week's end gives the week's time.

There are quite a lot of details about the machine, which, while interesting enough, have no bearing on its mode of operation.

Several shops have these machines, and all have the same experience with them. The men think it part of a deep laid plan to get a full day's work out of them, and kick accordingly. It is sometimes very hard to explain away, but the fact is, the machine is not calculated in any way to correct evil habits, its object being solely to lighten the time-clerk's work, and to make the workman understand that he is paid from a time-book of his own posting.

Herron, working four hundred men, got one of these things, and the men were in arms at once. They wouldn't have it, and Herron could not make them see the thing in the right light, so out it came. It is a good thing, in a way, for the men and for the proprietors.

It will be noticed, in the illustration, that all the men are of one kind, and it may be a matter of justice to state that if one of these chaps happened to have side-whiskers or even no whiskers at all, the machine would record his time all the same.

CHORDAL.

John Adt, New Haven, Conn , is perfecting a new automatic wire straightening and cutting machine, which operates readily with any size of wire, and cuts to any desired length.

Business in all of Mr. Adt's specialties reported steady. One of the new wire straightening and cutting machines was recently furnished to one of the largest wire manufacturing establishments in the country, and is working satisfactorily. An outfit of wire-working machinery was recently shipped to Newton, Wilson & Co., London, England. Also a metal working outfit was recently completed for the Queen City Dash Co., Cincinnati, O., manufacturers of Carriage Dash Boards.

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☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

NEW YORK, JULY 5, 1879.

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Seventy-six thousand dollars of corundum have been taken out of the Mason County, N. C., mine, at an expense of $16,000.

Decline of Skill in Machinists.

We notice with regret the gradual, yet sure, decline of skill among the different classes of mechanics, and especially among machinists.

This change is becoming more marked every year, and when we consider this fact the question at once suggests itself, What is the cause? We believe from our own experience and observation that this retrogressive course is caused by the introduction and use of automatic and other easily managed machinery. We might fill this paper with statistics showing the amount of labor saved, and skill dispensed with by the use of such machinery, but this course would be trespassing upon the patience of the reader. There are hundreds of cases where, at the present time, one man by the use of a machine, can do the work of from fifty to seventy-five according to the old methods, and all the pieces are thoroughly interchangeable and more accurately finished than could possibly be done by hand.

Take, for instance, the manufacture of watches, where one girl can, by the use of a machine, cut thousands of the smallest gear wheels in a single day, some of which would have to be examined with a glass to discover the teeth.

Yet the rapid strides of civilization have necessitated improvements whereby engines and machinery may be produced more quickly and cheaply. As a natural consequence, this universal demand, not only at home, but abroad, stimulated as it is by the hope of large pecuniary rewards, has set the inventive geniuses at work, and wherever we turn we at once see the result.

While these improvements in machinery have been steadily going on, how has it been with the machinists as a class? We do not hesitate to say that they have been gradually losing ground.

In former times when such a thing as a planer was unknown, all flat surfaces, such as guides, valve seats, rods and bed plates, had to be chipped and filed, therefore a man had to be skilled in all branches of the business.

A boy was bound from three to five years by a contract to serve his employer, who in return was to give him all the advantages that his facilities afforded.

Under this discipline the boy generally became a first-class workman, if there was any mechanical ability in him, beginning as a helper in the blacksmith's shop and advancing in a regular order of promotion until he had passed through all the routine of the business. A person after having graduated under these circumstances, was fully capable of taking charge of any part or all of the work.

At the present time a boy is not bound to his employer except by a verbal agreement, which is often broken upon the least provocation, and is generally kept upon the class of work which he is able to do best. Consequently at the end of three years, he finds that he is hardly able to do more than run a lathe or do vise work, and as far as the mechanical nature of iron or its various manipulations are concerned he knows nothing.

In regard to drawing, he gets no information whatever except from the foreman, who may perhaps give him a few specimens on a rough board with a piece of chalk.

The cases are very rare where an apprentice gets an opportunity to set valves or understand any of the problems of their theoretical construction. We know of a little incident which took place in a machine shop when planers were first being introduced, after the machine had been set on its foundation and the work placed upon it. A cut was started, and, as might be expected, the machinists gathered about the machine to see its operation. They were unanimous in their condemnation of it, and one man said: "Oh, give me a good hammer and chisels, and I will beat it all holler." How is it now? The trade is all cut up into the following branches:

Tool makers, fitters or vise-hands, lathe-hands, planer-hands, and how many more hands we will not attempt to say. The most remarkable feature about it is, that a tool-maker cannot work at fitting; fitters cannot work on a planer; the planer-hands cannot run a lathe; why? Simply because they have confined themselves to only one branch, and when they are discharged from one job, they can do nothing but that particular branch upon which they have been at work.

The contractor or owner of a machine shop will, at the present day, hire the cheapest man that he can get to do the work, and, if he has a handy man in the shop, or laborer that can run a lathe, he will at once put him to work at the machine. This step always causes a general murmur among the machinists who have served their apprenticeship at the business. With this introduction of cheap help and the use of labor-saving machinery which requires very little alteration, the position of the machinist has become anomalous.

All will admit the truth of this statement, and will at once say in the language of a modern *philosopher*, "What are you going to do about it?" Well, the first thing for the machinist of to-day to do is, to face about and map out a new course. He must in the first place spend his evenings at home instead of wasting his time, either on the street or in the beer, or billiard saloon, and the money spent there, which is worse than thrown away, should be saved and invested in good and useful books and periodicals. Even if a man is fifty years old, he is not too old to improve his condition. Dr. Franklin did not begin his philosophical pursuits until after he was fifty years of age. If the machinist only has ten cents a day to spare, let him lay it aside until he has enough to purchase some good book treating on the business that he intends to follow, for he can only read one book at a time, and therefore does not require a small fortune at once. We remember a machinist who was admitted to be a first-class workman, and, although not a drunkard, used to spend from six to eight dollars a month for beer, and to-day he is as poor as Job's turkey. If he had invested the same amount in good books and studied them, he might have filled an enviable position.

This is only one instance out of a large number with which we are acquainted.

Many will say, "We cannot all be foremen and master mechanics, and we may throw all this time away for nothing." To this we answer, Did you ever hear of knowledge being detrimental to a person? and, on the other hand, Has not the want of it sent many a poor mortal prematurely out of the world? The machinist of to-day needs study outside of the work that he has to do in the shop, and there are a great many, who, in years to come, will look back with deep regret upon the hundreds of hours which were wasted during the business depression when nearly all the shops were working short time. It was then that they ought to have posted themselves so as to be capable of filling responsible positions. Poor mechanics can always be found in abundance, but good, steady, honest and reliable men are very scarce and are always in demand.

A man who follows the machinists' trade and has no more interest in it than to worry through ten hours a day and then get home, or who does not possess the natural qualifications which will enable him to become master of his business, has made a grievous mistake, and should at once leave it and commence something else, or make up his mind to be poor and dependent all his days.

Do not be discouraged if you do not drop at once into a position, but adopt the golden rule:—"If at first you don't succeed, try, try again." The machinist should not only study but also experiment, not on some foolish vagary like perpetual motion, but on good common-sense subjects, and advance himself in the higher branches of science.

Above all things, avoid following a single kind of work. If your employer will not give you a change of work, do not trifle with him, but move and only remain on one kind of work long enough to learn it thoroughly.

Visit large factories and shops whenever opportunity offers, and cultivate a taste for investigation. Do not violate any of the laws of health, but be temperate in all things.

Hold all the ground that you gain and strive to make progress all the time. Thus you will live to a good and noble purpose.

The Conciliation Cure.

So much has been written upon the subject of strikes and the comparative relations of labor and capital, that it would almost seem as though the evidence were all in and the case closed. But the chief difficulty has usually been that the parties to labor disputes take a jaundiced view of each others' position and motives.

On the one hand, the workingman too frequently is unable to look upon capital in any other light than as a monstrous and utterly selfish oppressor. Witness all the great strikes that have passed into history.

Upon the other hand, too many employers seem to act as if they believed wages should buy heart and soul, and fiber, instead of being merely the recompense for the labor of the hands. In a word, all the finer forces of kindness and manliness, and regard for the rights and feelings of others too often seem, by their bearing, wholly left out of the account.

Is it matter for wonder, then, that disputes and ill feeling and strikes should occur as a natural sequence to this state of things? No more than that an explosion should in due time follow the introduction of a lighted fuse into a powder mill.

Now, as a remedy, suppose that in any shop or factory where men are employed, generous and just employers should put force and caste aside, and endeavor to enter into and respect the feelings of their men, *as men*, not only with regard to wages, but also with reference to the appreciation and advancement which are better than wages—who doubts that the men would find it out?

Suppose it should be made clearly manifest that the aim of the employer was not to squeeze wages down to the lowest possible breathing limit, but to pay all that the work would bear, *to seek to educate all up to the point that would enable them to earn more*, and to reward faithful and long service by higher pay and special privileges, whenever possible, who doubts that new "go" would be put into every motion in that shop?

Who doubts, that, if ordinary expenses were increased, extraordinary expenses would be diminished, and that less waste, both of time and material, would occur, and that more work and better work would be done? It is a source of gratification to know that strikes and labor troubles are of rare occurrence in machine shops. We would that as good a feeling existed between employers and employees in every industry.

Messieurs employers and employed, try the conciliation cure, and we shall presently see the twin demons of blind force upon the one side, and money despotism upon the other, exorcised and disappearing together before the combined power of justice and forbearance and regard for the motives and feelings of others. And with them will end strikes and all the loss and hatred and misery occasioned by them.

Wages Dependent on Skill.

In a large machine shop not far from this city, they seem to have got the wages question down to about as fine a point as could be desired anywhere, and the plan seems to be working well. The working force is constantly being recruited from boys and young men, beginners, at all grades of pay, from $2.50 per week upwards, according to capacity, and these are promoted from time to time, as they learn more and occasion serves. Whenever a new man is hired, he can only expect to receive ordinary or average wages at first, however skillful. This is in the interest of permanence and to discourage tramping jours.

The ordinary average wages of good machinists, blacksmiths, pattern makers, &c. begin on a basis of $2.00 to $3.00 per day, running up to $3.50, $4.00, and $4.50

for better skill and long service, while special qualifications entitle the number of workmen in the branches named to wages of $7.00 to $8.00 (in some cases even more) per day. Nor is this rate grudgingly paid, or kept a secret in the shop. Every man and boy knows that it is paid because it is earned, and that it will be paid readily and cheerfully, to all who may qualify themselves to earn it.

Need it be added that the AMERICAN MACHINIST is well read in that shop? Not any more than that thrift and emulation lend steadiness to the turning of every shaft and vigor to the motion of every file.

And the employers—how do they fare under such a system? They?—It is whispered that last year, the partners divided nearly $50,000 net profits as their share.

The Emery Wheel Industry.

The manufacture of solid emery wheels is now an important and growing industry in the United States. For several years this business had a constant struggle against a deeply rooted prejudice (not yet fully eradicated) against the use of the article in workshops; but now there are many branches of mechanical work that could scarcely be carried on without the solid emery wheel. Every complete machine shop should have at least one emery wheel, if only for grinding tools, as it will save considerable time and money every year. There are many bugbears conjured up (often, we suspect, by makers of emery wheels themselves) to put manufacturers on their guard against particular wheels. Glazing, we venture to assert, is not a common fault with solid wheels. If properly used, there is scarcely a wheel in market that will glaze. Should this occur in rare instances it can be easily remedied by turning off the wheel.

If a wheel contains no flaw (which should always be assured before working it) there is no more danger of its bursting than with a steam boiler. Both are liable to accidents if carelessly managed. Some wheels will not run in water and retain their cutting qualities. But why run them in water? Tools may easily be ground dry on a solid emery wheel without drawing the temper. We often hear strong complaints about the high price of emery wheels compared with the cost of material and the labor of making them. If emery wheels sold with as little trouble and expense in distribution as bar soap or wood screws, a large discount might be made from present prices. But the producer of any commodity must take into account all the expenses of manipulation in fixing his selling price, and it generally requires considerable valuable logic to secure a new customer for an emery wheel, a little more of the same to collect the bill, and a continuation of the article to hold on to him permanently. As soon as most of the emery wheels used can be sold over the counter for ready cash, makers will be sure to reduce their prices.

Emery wheels often fail to give satisfaction through no fault of the maker. The purchaser frequently thinks he knows just what grade and size of wheel to order for a kind of work he has never undertaken before, acts upon his judgment and makes a huge mistake. Our advice is, if you don't know beyond all question what kind of a wheel you require, go to an emery wheel maker who has had experience in supplying wheels for that kind of work you wish to do, and let him make the selection. It is for his interest to sell you the right kind of wheel to secure your custom. If he don't do it the first time, knowing exactly the requirements, the best course is to try some other manufacturer. No single emery wheel is the best for all purposes. Each has its peculiar excellencies. When you get a wheel that works just right, don't change to another make, even if the agent offers to sell to you twenty per cent. cheaper. Trying experiments, as a rule, carries with it more outlay than income.

One word more to users of emery wheels—don't run one without a firm foundation and a true mounting.

We append a list of the solid emery wheel manufacturers in the United States:

NEW YORK BELTING & PACKING Co., New York.
UNION STONE Co., Boston, Mass.
THE TANITE Co., Stroudsburgh, Pa.
VITRIFIED WHEEL & EMERY Co., Westfield, Mass.
NORTHAMPTON EMERY WHEEL Co., Leeds, Mass.
COSMOPOLITAN EMERY WHEEL Co., West Charlton, Vt.
LEHIGH VALLEY EMERY WHEEL Co., Weissport, Pa.
DETROIT EMERY WHEEL Co., Detroit, Mich.
GODDARD, SON & Co., Essex, Conn.
CELLULOID EMERY WHEEL Co., Newark, N. J.
DIAMOND EMERY WHEEL & MACHINE Co., Providence, R. I.
AMERICAN TWIST DRILL Co., Woonsocket, R. I.
F. B. NORTON, Worcester, Mass.
ASHLAND EMERY WHEEL Co., Ashland, Mass.

Besides the above, parties are starting the manufacture of emery wheels at Manchester, N. H., at Philadelphia, and at Leeds or Northampton, Mass., further particulars of which will be given in these columns at some future time.

Sound Newspaper Principles.

At the last meeting of the Ohio Editorial Association, at Cincinnati, Mr. Whitelaw Reid, Editor of the *New York Tribune*, delivered an address in which some unusually good advice was given newspaper publishers, from which we make the following extracts. These views are in exact accordance with the plan of conducting the AMERICAN MACHINIST:

"One golden rule should be kept before every occupant of the counting-room, 'This is a one-price establishment.' There is no other fair way for advertisers; there is no other self-respecting way for a newspaper. If you sell a certain part of your space at all, sell it under the same conditions to all alike. There is no special dispensation for newspapers which permits them to commit commercial sins and escape the commercial penalty. If you do a 'Cheap John' business, you must take a 'Cheap John' standing.

"Sell your wares for what they are. Don't surrender to the vulgar folly that you must make advertisers believe that you have an incredible circulation, or even that you have the largest circulation. The value of a circulation is often comparative, anyway: one paper with a list of but 10,000 may be worth as much as another which prints 100,000. The public is finding out the humbug about big circulations, and sooner or later it goes where it gets its money's worth. *The Nation* announces that it prints only 7,500 copies, all told, yet it gets 15 cents a line for its advertising, has plenty of it, and gives the money's worth every time.

"Sell your own wares; don't fool away time trying to run down your neighbor's. What difference does it make what his circulation is? Probably you don't know much about it anyway; but you do know about your own. Put a fair price on space in that, and give your whole mind to selling it. If your space is worth the price you ask, you can get all the advertising you want, whenever business is prosperous enough to warrant it, or advertisers are wise enough to know how to make business.

"Keep the advertising in the advertising columns. I realize that this is not the golden age, and that we cannot expect impossibilities. I do not know of five considerable newspapers in the United States rigidly adhering to-day to this rule; I doubt if there is one that has never, under any temptation, departed from it. But we can all see that honest dealing with our readers, and honest dealing with our advertisers alike tend in this direction. It may be said, plausibly enough, that there is a wide class of subjects in which the public has a certain interest, while private parties have a greater interest; that there is, therefore, a certain legitimate excuse for publishing matter about them as news, and also a certain legitimate excuse for taking pay for it as advertising. But this opens too many doubtful questions, and gives the cash-drawer too great a leverage on the editor's judgment, as to the real degree of public interest in the news. The safe way, the true way, the way to which we are ultimately coming, not soon, perhaps, but surely, is to put whatever is to be paid for squarely and honestly into columns that are recognized as paid for; to select what is to be printed as news solely with reference to the largest interest of the widest number; and then, if such selection happens to further private interest as well, to take the pay for that in the high esteem with which those interested will come to regard a newspaper so judicious in its selections."

Some financial pessimists would have us believe that the recent movements in Government Bonds, and more especially the eagerness with which the $10 certificates were absorbed by the public, indicate not merely that the business of the country is going directly to the dogs, but that it is already there, and the dogs are tearing it. Not so. This much it does mean, however, that the general subsidence of events, since the war and the panicky days of '73, has left a good many ugly snags exposed in the channels of business and social life. Notably, very many Savings Banks lie helplessly stranded behind the receding wave of public opinion. Inherent weakness and official malfeasance—that is all.

Business Specials.

Thirty cents a line for each insertion under this head.

The Pratt & Whitney Co., of Hartford, Conn., make a specialty of Cutters for the teeth of gear wheels, that are shaped entirely by machinery and will make interchangeable all gears that are cut with cutters of the same pitch.

Those wishing special tools designed and built should write to W. H. Warren, 25 Hermon Street, Worcester, Mass.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Questions and Answers,

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) C. F. H., Lynn, Mass., writes: Please let me know through your paper, of a way to soften castings that have become chilled; have tried several ways, but they are not thorough enough. A. There are a great many ways of annealing iron castings, but few are thorough in their work. In order to anneal iron it is necessary to subject them to an intense heat, and in contact with some substance that will absorb some of the carbon contained in the castings. The following will give satisfaction and is used for the purpose of making malleable iron. Take either a cast or wrought iron box or pot, and strew the bottom with Hematite ore (pounded), or iron scales from the rolling mill, then put in a layer of castings, each article immbedded in the ore and perfectly isolated, then cover about half an inch of ore, then another row of castings and so on until the box is nearly full, when it is covered with a good body of the ore. The box is then ready for the furnace into which it is put, and the heat gradually increased until a bright red has been attained. It is kept up to that degree of heat for from sixty to eighty or ninety hours, and then left in the furnace to cool. The longer the heat is kept up the more perfect will be the malleability. The above process requires some experience. The scale simply can be removed from iron castings by immersing in a bath of diluted sulphuric acid and letting them remain over night.

(2) N. G., Trenton, N. J., inquires, What is the most simple way to ascertain the speed of a locomotive? A. The diameter of driving wheels in feet multiplied by number of revolutions per minute, product multiplied by .0357, equals miles per hour. Miles per hour divided by diameter of driving wheels in feet, quotient multiplied by 28 equals number of revolutions per minute.

(3) J. G., Atlanta, Georgia, asks: Can you give me a brief description or principal dimensions of the locomotive America, which took the prize at the Paris Exposition in 1867. A. Diameter of cylinders, 16 in.; stroke, 22 in.; diameter of driving wheels, 5 ft., 7 in.; truck wheels, 2 ft., 6 in.; tender wheels, 2 ft., 6 in.; total wheel base of engine, 32 ft. 3½ in.; driving wheels, 8 ft., 6 in. between centers; truck wheels, 5 ft. 9 in. between centers; from trailing wheel to centerpin of truck, 19 ft. 5 in.; mean diameter of boiler-48 in.; copper tubes, 142, 2 in. diameter, 10 ft. 11 in. long; length of fire grate, 5 ft. 6 in., width, 2 ft. 10 in.; maximum depth of fire-box, 4 ft. 11⅝ in.; tube surface, 812 sq. ft.; fire-box, 84 sq. ft.; grate area, 15.62 sq. ft.; transverse distance apart of cylinders, 6 ft. 2 in.; connecting rods, 7 ft. 3 in. between centres; inside main steam pipe, 5⅝ in.; branch pipes, oval section, 4⅛ in. x 3¾ in.; steam ports, 16 in. x 1¼ in.; exhaust port, 16 in. x 2⅛ in.; outside lap of valve, ¾ in.; inside lap of valve, 3-32 in.; lead in full gear, ⅛ in.; diameter of 2 blast nozzles, 3¾ in.; diameter of driving axle, 6½ in.; diameter of truck axle, 4⅛ in.; center diameter of driving axle journal, 6⅛ in. x 7⅞ in.; long truck axle journals diameter, 4⅛ in. x 8 in.; diameter of chimney, 15¾ in.; height of chimney above smoke-box, 5 ft. 7 in.; above rail, 14 ft. 1½ in.; center of boiler above rail, 6 ft., 4 in.; to top of cab from rail, 13 ft.; extreme width of cab, 9 ft., 1½ in., weight of engine, light, 56,101 lbs., loaded, 62,500 lbs. on drivers, 38,500 lbs., on truck, 24,000 lbs.

(4) N. C. B., Nashua, N. H., writes: I would like to have you furnish me with the rule usually adopted by boiler-makers in calculating for a certain number of horse-power. Please insert among questions and answers. A. The number of square feet of heating surface required to evaporate a cubic foot of water per hour, which is equivalent to an actual horse-power is as follows:

Cornish boilers,	70 square feet.
Land and Marine,	8 to 11 square feet.
Locomotive boilers,	5 to 6 square feet.

For each nominal horse-power a boiler (land) requires, 1 cubic foot of water per hour, 1 square yard of heating surface, 1 square foot of fine grate surface, 1 cubic yard capacity, 28 square inches of flue area, 18 square inches over bridge wall. For cylindrical double-flued boilers, length multiplied by diameter, divided by 6=nominal horse-power.

(5) G. H., Boston, Mass., inquires: Is there any simple process whereby I can determine the quality of an oil, and ascertain if there is any tendency to gum? A. Yes. The most simple process that we know of is that of Nasmyth. He uses a plate of metal 4 in. wide by 6 feet long, on the upper surface of which six equal sized grooves are planed. This plate is placed in an inclined position, about 1 in. in 6 ft. Now suppose we have several kinds of oil which we desire to test, we simply pour an equal quantity into each groove at the upper end. The oils start on a fair race down hill, some get ahead the first day, some the second and third days, but on the fourth and fifth day the truth begins to come out. The bad oils gradually come to a standstill by their coagulation, while the good oils hold on their course, and at the end of eight or nine days no doubt is left as to which is the best. This plan is in use at the Stevens Institute of Technology, only in place of the iron plates and grooves a plate of thick glass is used. The glass is kept covered during the test so as to exclude the dust.

Personals.

Mr. A. H. Fancher expects to exhibit American tools and Machinery at the Royal Agricultural Fair, which opens in London, on the 30th of June.

Mr. Fancher began his business life in a banking office, but being a born mechanic, nature would have her way, and machinery gained an able master and servant. He was for some years one of the firm of Norton & Fancher, Chicago (now Norton Bros.), manufacturers of tin ware, employing a large force of hands, but for several years has been in charge of an important department in Bliss & Williams' factory in Brooklyn, making dies and special tools.

Having undertaken the task of educating Europe in the interests of American machinery, we presume he will reside permanently abroad, with headquarters in London.

Mr. Geo. S. Lincoln, of the Phœnix Iron Works, Hartford, Conn., reports the wages paid by them as about 10 per cent. higher than they paid before the war and down to the years '62 and '63. Mr. Lincoln, the head of the firm, is a genial and capable gentleman, who means to show that the old house has plenty of vim left in it yet, notwithstanding it was the training school, from which have gone out so many men who have since become justly prominent in machinery circles.

LITERARY NOTES.

FRICTION AND LUBRICATION, DETERMINATIONS OF THE LAWS AND COEFFICIENTS OF FRICTION BY NEW METHODS AND WITH NEW APPARATUS. By Robert H. Thurston, A. M., C. E., Professor of Mechanical Engineering at the Stevens Institute of Technology, Member of American Society of Civil Engineers, Am rican Institute of Mining Engineers, Fellow of N. Y. Academy of Science, etc., etc. Price, postage prepaid, $1.50; cloth. Published by the *Railroad Gazette*, 73 Broadway, N. Y.

The author of this book has long been a student and independent investigator of the laws of friction, and of the effects of lubrication and the different kinds of lubricants, and has aimed to present here a complete abstract of existing knowledge on the subject. He discusses at length, and with such illustrations as are necessary, Rolling Friction on Roads and Railroads, Frictional Resistance of Railroad Trains, Friction of Cordage, Fluids, Journals, Brakes, Rails, Belts, Pump Pistons, Mill Shafting, etc., etc.

Morin's, Coulomb's, Ammonton's, Rennie's and other experiments; Lubrication and the different kinds of Lubricants in use; their Characteristics, Composition, and Effects; Limits of Pressure; Size of Journals, and methods of oiling them; Testing Lubricants; Identification of Oils, their Classification, Composition, Alterations of Composition, Mixtures, Specific Gravity, Density, Effects of Heat, Gumming, Drying, etc., etc. Impurities of Mineral Oils, Oleography, Cohesion Figures, Chemical Tests, General Methods of Analysis, Preparation and use of Re-agents, Reactions, Metcalfe's Experiments, Methods of Testing Lubricants, Thurston's Apparatus and Experiments, Friction under varying Pressure, and with varying Velocities, Commercial value of Lubricants, and many other kindred Subjects.

The book contains many tables for ready reference, and engravings of the different kinds of testing apparatus. Many of these points are entirely new discoveries, and the author's reputation alone is sufficient to entitle it to an extensive circulation.

A PRACTICAL TREATISE ON THE MOVEMENT OF SLIDE-VALVES BY ECCENTRICS, FOR THE USE OF ENGINEERS, DRAUGHTSMEN, MACHINISTS, AND STUDENTS IN GENERAL. By C. W. MacCord, A.M., Professor of Mechanical Drawing, Stevens Institute of Technology, Hoboken, N. J. Illustrated by 8 full-page copper-plates. 4to. Cloth $3.00. Published by D. VanNostrand, 23 Murray and 27 Warren streets, New York.

The author of this work has a reputation so well established that it is unnecessary to add anything by way of introduction, but, in reference to the above work, we would say, that it is represented as being the most plain and practical work that has ever been printed. There are two points which characize this work, viz.: carefully avoidng all abstruse formula, and considering the engine in its simplest form, and with the most direct connections.

The object of this work is to aid practical engineers in forming a clear idea of, first, the nature of the motion and what the valve can be made to do; second, the requirements of the engine, and what the valve must be made to do; and third, the construction of the movement and how to make the valve do what it is to do. The merits of the work rest wholly on the manner in which these questions are presented. In this work the different parts of the engine are shown to move with geometrical precision, in lines and about centers, which, having fixed linear relations to each other, are just as susceptible of accurate delineation on paper, as of accurate adjustment in metal; they did so before their motions were analyzed, and would continue to do so to the end of time, though the art of analysis were forgotten. In fact, the mathematical education of the engine has never gone beyond geometry; it was planned by geometry, it was built by geometry, and it runs by geometry. It will answer no questions which it cannot answer by geometry.

By dissecting the slide-valves, and considering its members and their functions, one by one, the author has endeavored to make their combined action more readily comprehended. The five chapters of the work are thus classified:

General investigation of the eccentric motion.

Of the action of a valve, as applied to a single steam port.

The action of the exhaust-valve, of the three-ported, or common slide-valve, and of the two-ported, or box-valve.

Of independent cut-off valves.

The angular vibrations of the main connecting rod, and the eccentric rod.

We conclude by saying that we believe that the author has succeeded in the accomplishment of his object.

MANUFACTURES.

A new mill to roll merchant iron is being erected at the Iron Works Rolling Mill at Fall River, and will have a capacity to turn out a train ten rolls in length.

The emery-wheel works of F. B. Norton at Worcester are running on full time, and have just made a shipment of three hundred of these wheels to a large manufacturing concern in Illinois. They have also filled orders from Fuller, Warren & Co., and Ransom's stove works at Troy for corundum wheels, which have met, in both these establishments, with very general satisfaction.

The Ames Company of Chicopee have shipped to Sweden a 24-inch combined drill and slotting machine.

The Keystone Bridge Company have several bridges under way; among them are thirty-four for the Cincinnati Southern Railroad and a highway bridge across the Mississippi at Fort Snelling.

Mr. J. A. Herrick, connected with the Nashua Iron and Steel Company, Nashua, N. H., has resigned his position and accepted a situation with the Black Diamond Steel Works.

F. M. Gilpin, late of the Midvale Steel Works, has arranged with Crerar, Adams & Co. to represent them as traveling salesman.

The Winslow Car Roofing Company have now in contract orders for 4,000 car roofs

The machine shops of the St. Louis, Iron Mountain & Southern are being removed from Carondelet to De Soto, Mo, as rapidly as possible, so as to aid in change of gauge.

The Brooks Locomotive Works of Dunkirk, N. Y., have received an order for three narrow gauge locomotive for the Texas & St. Louis road; also for a narrow guage locomotive for a road in Mexico.

Iowa City is wide awake on the subject of more railroads, more manufactories, and more prosperity generally. Meetings are being held and great efforts made in the right direction.

Owens, Lane & Dyer, St. Louis, one of the largest manufacturing establishments of portable steam-engines, stationary steam engines and saw mill machinery in the country, are making considerable efforts to establish a trade in the Southwest and in Mexico. They have made some progress in that territory.

The buildings of the new rolling mill of the National Tube Works Company, McKeesport, Pa., are finished, and the furnaces, machinery, etc., are being erected. It is probable manufacturing will be commenced in July.

The Missouri Sheet Iron and Boiler Works, St. Louis, are quite busy. They employ eighteen men steadily. The work is nearly all new, few old boilers being in the shops at this season.

An axe factory is about to be started at Gore Bay, Canada.

Simpson, Hall, Miller & Co., are soon to build a large addition to their factory at Wallingford, Conn.

William Ellison, St. Louis, is working twenty hands upon engines, portable and stationary, and has just completed a stationary engine of handsome pattern.

The Baldwin Locomotive Works, Philadelphia, are now working 14 hours per day, and have upwards of 2,000 names on their pay roll. They have orders from many of the leading railroad companies in the United States, and they are just completing about 20 large locomotives, on the consolidated pattern, for Australian railways. The New York Central Railroad Company have just given out a contract for 25 locomotives.

The work on the new four-run mill of Mr. Geo A. Granger, of New Lexington, Ohio, is going steadily forward and will be completed about the 1st of July. Messrs. Griffith & Wedge, of Zanesville, Ohio, are furnishing the engine, boiler, shafting and gearing.

The Western Foundry, owned by Marshall & Co., St. Louis, is running steadily with a force of forty hands. They report a decided increase in business over last season.

Messrs. Stout, Mills & Temple, of Dayton, Ohio, have closed the contract with Messrs. Jost, Durst & Son, of that city, for furnishing and erecting a nine-run new process flouring mill, with all modern improvements. In addition to the nine run of four-foot burrs, there will be five set of chilled iron rollers for the granulation of middlings. Twenty reels, covered with the best brand of bolting cloth, and seven large and improved middlings purifiers, will be used in the mill. The mill will be driven with a Buckeye automatic cut-off engine, 18 by 36 inches, made by the Buckeye Engine Company, of Salem, Ohio. All of which Messrs. Stout, Mills & Temple are to furnish and start. The mills is to be completed by Sept. 1st.

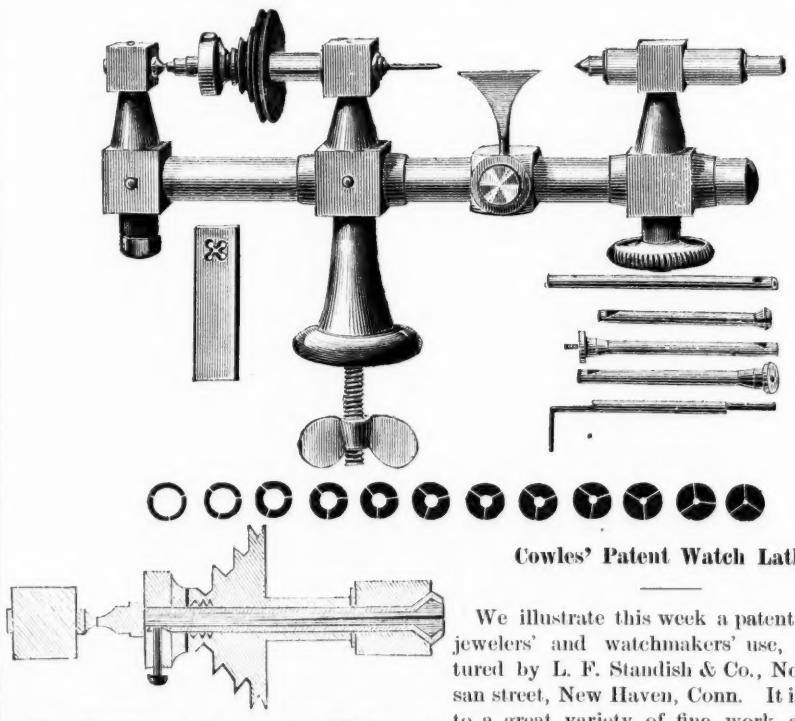
The new corporation at Manchester, N.H., intend laying the foundations for their cotton mill at once.

P. J. Pauley & Bro., St. Louis, have all the work they can do furnishing their new steel, case-hardened and patent jails. Business has been remarkably good for many months.

A bolt and screw factory, with iron supplies from the Hamilton rolling mills, is to be started at Merritton, Canada.

The Pennsylvania File Works of McCaffray & Brothers, Philadelphia, have recently made considerable shipments of files to Europe.

The Atlanta Machine Works, in Atlanta, Ga, owned and operated since the war by Messrs. Porter & Meaken, occupy three acres of ground, upon which are erected the buildings for the machine shop, foundry, pattern shop, boiler shop and blacksmith department Owing to the limited number of works of this character in the South, a general line of machine work and repairing is carried on; but their specialties are the manufacture of steam pumps for railroads, quartz mills, miniature locomotives, and Brook's original cotton presses.



The Manchester Locomotive Works are quite busy, and report sales of steam and fire engines to Randolph and Brockton, Mass., Portsmouth, N. H, and 2 to Oregon, and a self-propeller to Hartford, Conn.

The Pittsburgh Bridge Company has a contract for an iron highway bridge of 165 feet span, at Powhattan, O., the contract price being $3,200.

The Manchester (N.H.) Locomotive Works have just finished two shifting engines for the Boston & Maine, and are building five very heavy freight engines for the Chicago, Burlington & Quincy.

The Schenectady Locomotive Works are building five heavy passenger engines, with 18 by 24-inch cylinders, and 5 feet 9-inch drivers, for the Chicago & Alton road.

Alfred T. Sinker, formerly of Sinker, Davis & Co, has opened a machinery store in Indianapolis, on South Pennsylvania St.

Our friends, Townsend & Jackson, of Albany, N. Y., have been kind to the bookmakers and booksellers, if the possession of a very handsome and complete mechanical library be any index. Thanks to its own merits and their friendly interest, the AMERICAN MACHINIST has also a large list of subscribers and readers among their workmen, it being their aim to do all in their power to educate their men, and thus fit them for better work and higher pay. Business good. This firm has recently completed and shipped a new patent excavator for Mr. R. R. Osgood, of Greenbush, near Albany, intended for use in digging phosphate, near Charleston, S. C. The machine has been well tried, and possesses great merit.

Bliss & Williams, Brooklyn, are building two of their new No. 5 Power Drawing Presses; one for the St. Louis Stamping Co., of St. Louis, and the other for the Dover Stamping Co., of Boston.

They are running a full force of 120 men, mostly machinists, and are full of orders, needing only more room to enable them to employ more men.

Their line comprises many special tools. As for instance: tools for making tin tobacco tags (of which one firm in this city stamp out three tons every month).

They are now, also, sending condensed milk can tools to Switzerland; tools for making bottle capsules, to Germany; tools for lobster packers, to the British Provinces; tools for stamping out horseshoes complete with calk for use; for making meat and petroleum cans, and so on, ad infinitum.

Mr. Job H. Jackson, of the Jackson & Sharp Company, Wilmington, Del., has been appointed by the Governor a member of the commission to represent that State at the coming convention in New York City to confer, with reference to the proposed world's fair in this city in 1883.

P. & F. Corbin, New Britain, Conn., are building a new brick blacksmith shop.

POLISHING IRON.—To do this well, it must be first surface hardened, so as to give it a steel surface, as the iron is too soft to give it a bright polish. Any of the methods we have heretofore published for this hardening will do, but the following is recommended for this especial operation: Take one ounce of blue vitriol, 1 of borax, 1 of prussiate of potash, 1 of charcoal, and ½ pint of salt dissolved in hot water, to which add 1 gallon of linseed oil; mix well, bring your iron or steel to the proper heat, and cool in the solution. After this operation it is treated in the same way as steel is treated to give it a high polish.

Cowles' Patent Watch Lathe.

We illustrate this week a patent lathe for jewelers' and watchmakers' use, manufactured by L. F. Standish & Co., No. 26 Artisan street, New Haven, Conn. It is adapted to a great variety of fine work, and is arranged to fasten to the bench by a thumb-screw underneath.

The lathe is eleven inches in length, five and one-quarter inches high, and handsomely nickel plated. The bed, being a round steel bar, permits the tail-stock to swing freely upon it and fasten in any position, with a long bearing for holding tools for numberless operations. The cone pulley has four steps, and the spindle runs in hardened steel bearings. With each lathe are furnished one eccentric arbor, or tool-holder; one primary split chuck, twelve split chucks of graded sizes, from 5–32 down to 0, self-centering and self-tightening by a patent arrangement near the rear end of the spindle. There is also one male screw chuck, one female screw chuck, one lathe rest, one tail stock rest, and one 5–32 screw die, the size of the screw arbor.

Our illustrations show the graded sizes of chucks furnished with the lathe; also sectional view of the spindle.

We regret to hear of the sudden death of William Adamson, of the firm of Balder & Adamson, Philadelphia, manufacturers of glue, sand and emery paper. He was very highly esteemed as a public-spirited citizen, an enterprising business man, kind hearted and liberal in all his intercourse with others.

Machine Shop Wages.

Geo. S. Lincoln & Co., Hartford, pay foundry helpers 12 cts. per hour, or $1.10 per day; molders an average of $2.00 per day; blacksmiths, $2.00 to $2.75; machinists, $1.75 to $2.50 per day.

John Adt, New Haven, pays machinists rates ranging from $2.50 to $5.00 per day.

F. C. & A. E. Rowland, New Haven, pay machinists and lathesmen $1.75 to $2.25 per day; blacksmiths, $2.50 to $3.00; pattern makers, $2.25 to $2.75 per day.

The Wetmore Machine Co., New Haven, pay machinists and tool makers rates ranging from $3 50 per day downward.

Townsend & Jackson, Albany, pay machinists $1.80 to $2 00 per day for new men; pattern makers, $2.00; molders, $2.25 per day.

The New Haven Manufacturing Co. pay machinists $1.75 to $3.00; some men getting $3 50 per day; blacksmiths $2.25 to $3.25; pattern makers, $3.00 per day.

L. F. Standish & Co., New Haven, pay machinists $2.50 to $3.00 per day; screw makers, $2.00 to $250, with business improving.

The Worcester Machine Screw Co. pay machinists and tool makers $2 00 to $2.50 per day; the best workmen getting $3.50.

Bliss & Williams, Brooklyn, employ 120 men, mostly machinists and die makers, much of the work being peculiar and requiring special skill. They pay regular machinists an average of $2.50 to $4.50 per day; die makers, $2.75 to $4.00; blacksmiths, $3.50; pattern makers, $3.00 to $4 00 per day. Extra skilled workmen in either branch receiving higher pay.

At Springfield, Ill., Mr. Isaac A. Tewksbury writes us: "For rolling mill machinists, $2 40 is the highest price paid, and $2.50 for engineers; for railroad machinists in the Toledo, Wabash, and Western shops, from $2.00 to $2.70, while blacksmiths are paid from $2.00 to $3.00, and engineers are paid from $70 to $100 per month, according to number of mills run. Watch factory machinists (of which there are three factories in this State) are paid from $2.25 to $3.50, according to skill and experience. There are a few exceptions in the above rates of machinists and blacksmiths, where men are employed in some special skilled work. These are paid 25c. and 50c. more. Business in this locality is generally good, and good men in the above employment, have steady work and are paid monthly."

The Betts Machine Co, Wilmington, Del., pay machinists and blacksmiths an average of $2.00 a day, and pattern makers $2.25 a day.

E. P. Bullard, 14 Dey St., New York, sold last week $10,000 worth of second-hand machinery. This shows the drift of business.

The Morse Bridge Co., of Youngstown, O., has the contract for an iron highway bridge over the Wabash river at Peru, Ind. It will be 335 feet long, with roadway 22 feet wide, and two sidewalks, each 6 feet wide.

Morgan, Williams & Co., Alliance, O., shipped recently one of their patent steam hammers and one of their patented machines for pressing and forming shape work, to Bristol, England, for two different firms.

Machinists' and Engineers' Supplies.

Trade continues fair, and is not likely to slack off, as it sometimes does in the summer months. The tendency of prices is toward an advance. The Eaton, Cole & Burnham Co. are notifying their customers, under date New York, June 20th, as follows: "We hereby withdraw all quotations on brass goods. New prices will be furnished on application." We are pleased to note such movements as this. They mean higher prices and a general quickening of business all along the line.

E. P. Bullard, 14 Dey street, New York, has just issued a new illustrated circular, giving prices for Holt's Portable Forge (of which several sizes are made) and Reid's New Patent Drill Chuck. The latter is a very strong and serviceable chuck, having but four parts. The arbor passes through the chuck. It has two jaws, one of which has a V-shaped groove in its face, and the other a corresponding ridge. It sells for $8.50, and will hold drills up to 1¼ inches wide.

A new illustrated catalogue of Ewart's Detachable Drive Chains has lately been issued by E. T. Copeland, 30 Cortland St., New York. It contains 32 neatly printed page, and represents the parts of these chains full size. These chains possess an advantage over belting where the means for transmission of power is exposed to the action of the weather, chemicals, heat, cold, or where running in water.

The Betts Machine Co., Wilmington, Del., are about to publish a full illustrated catalogue of machine tools built by them. They have lately made a number of important additions and improvements.

Under the title of "Steam" an unusually well prepared, and finely printed publication for engineers has just been issued by Babcock & Wilcox, 36 Cortlandt St., New York. It treats of boiler explosions, their cause, and methods of prevention; also of combustion, boiler efficiency, fuel, scale, and other subjects connected with steam using. It is embellished with several engravings of the Babcock & Wilcox boiler.

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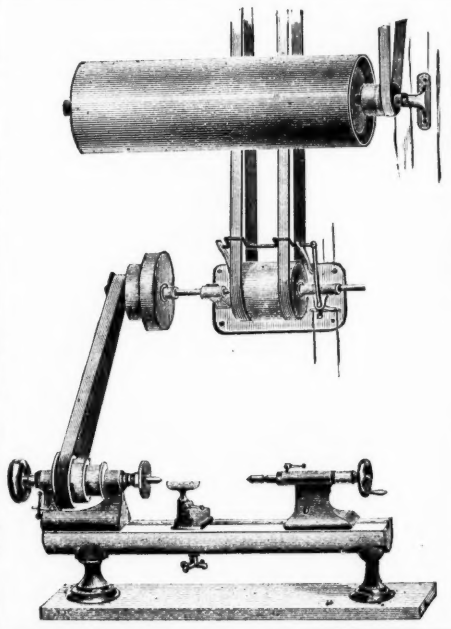

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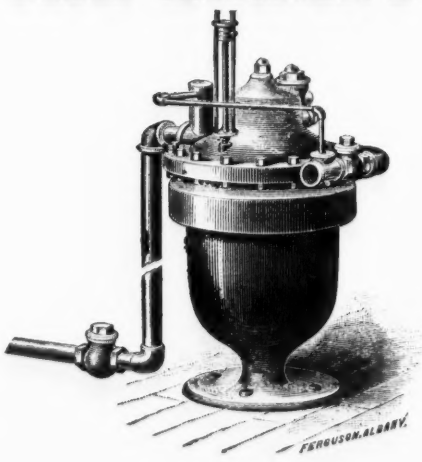

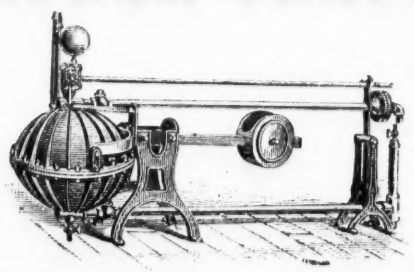

This Trap automatically drains the water of condensation from HEATING COILS, and returns the same to the Boiler, whether the coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes.

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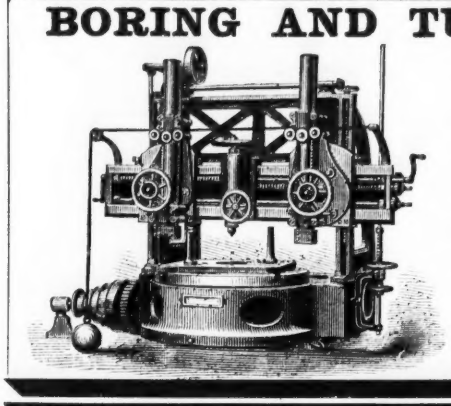

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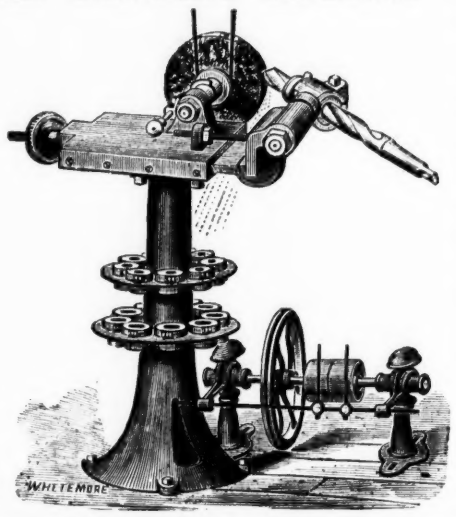

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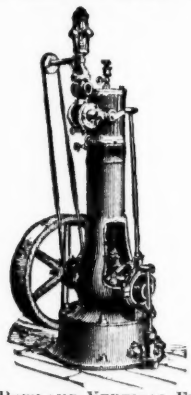

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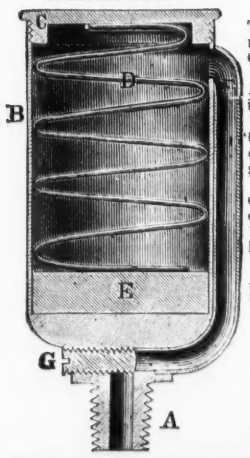

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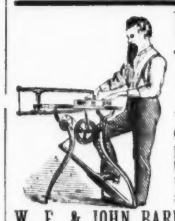

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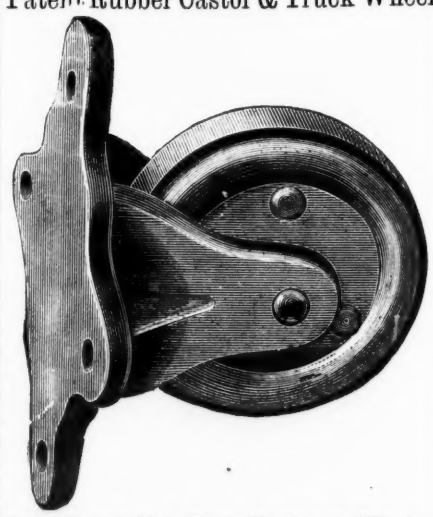

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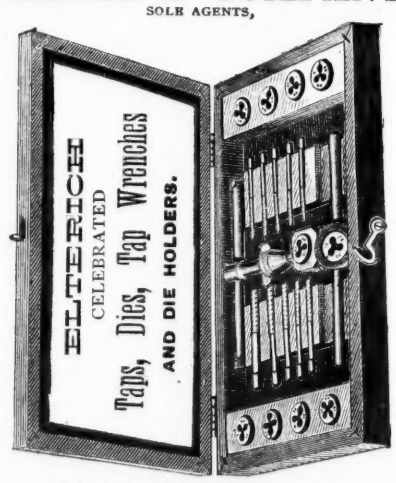

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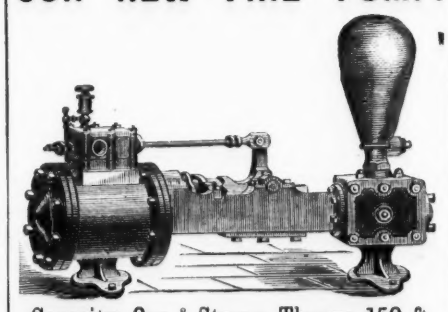

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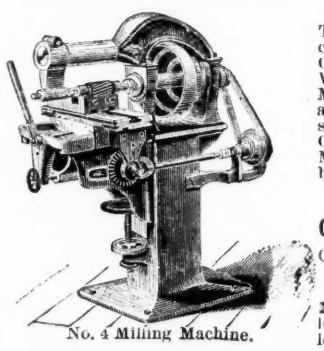

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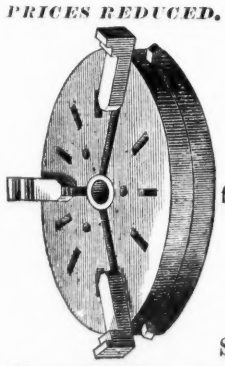

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N. B.

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Prof. R. H. Thurston. December, 1877.

Methods of Setting Boilers in Brick-Work.
Theron Skeel. December, 1877.

Boiler Explosions.
Stephen Roper. April, 1878.

Strength of Steam Boilers.
John W. Hill. July, 1878.

The Properties of Water.
John W. Hill. August, 1878.

Balance Pulleys.
Geo. M. Chordal. August, 1878.

Piston Speed of Engines.
Wm. Lee Church. September, 1878.

Composition of Fuel.
John W. Hill. September, 1878.

To Prepare a Shaft Properly for Turning.
J. J. Grant. October, 1878.

Practical Method of Setting the Valves of a Locomotive.
L. F. Lyne. November, 1878.

Boring Locomotive Cylinders.
L. F. Lyne. December, 1878.

Grinding and Polishing Metal Surfaces by Hand.
Thos. Hagerty. December, 1878.

To Turn a Shaft Properly.
J. J. Grant. December, 1878.

Engineering Popularized.
Wm. Lee Church. January, February, March, April and May, 1879.

Calculated vs. Actual Engine Duty.
W. H. Odell. January, 1879.

The Injector as a Means of Raising Water.
Wm. J. Williams. February, 1879.

Engine Duty and Indicator Cards.
Chas. A. Hagne. April, 1879.

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DURABLE, CHEAP, COMPACT, SIMPLE AND SAFE.

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2 1/2 TONS PER SQUARE INCH

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The Most Economical in the Use of Fuel,
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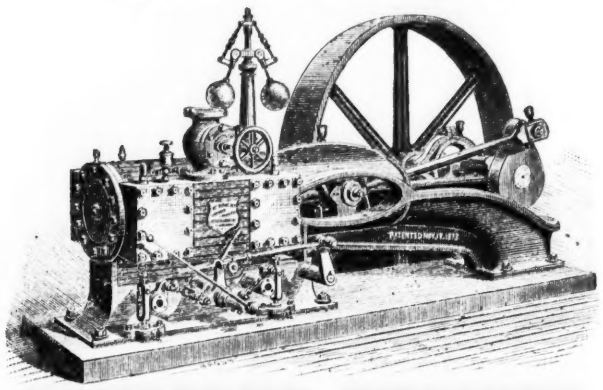

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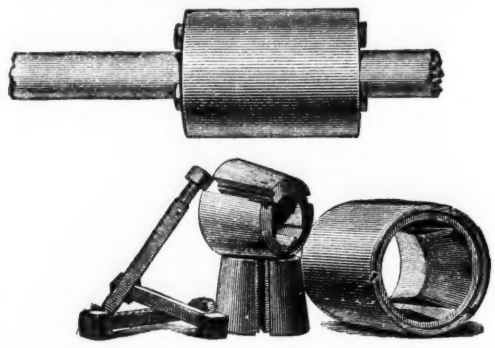

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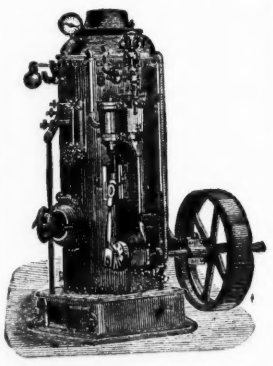

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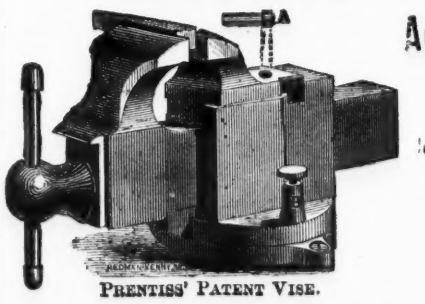

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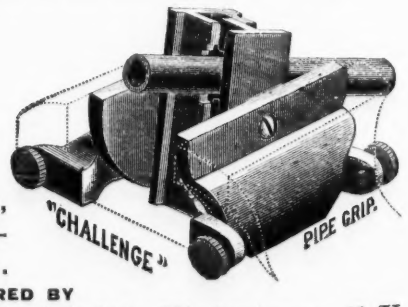

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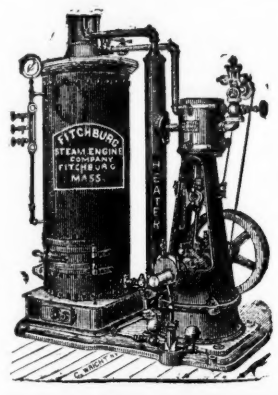

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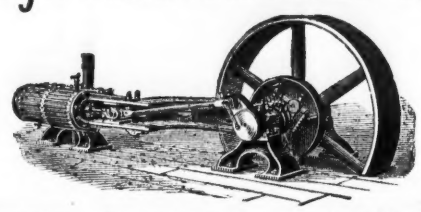

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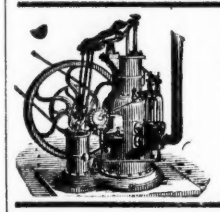

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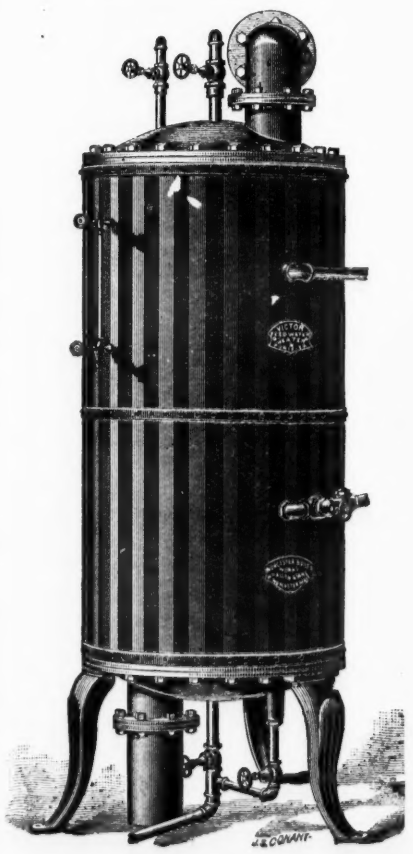

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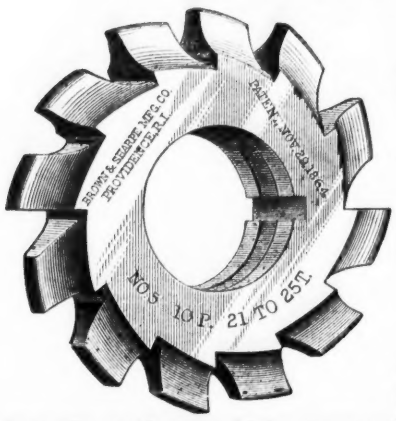

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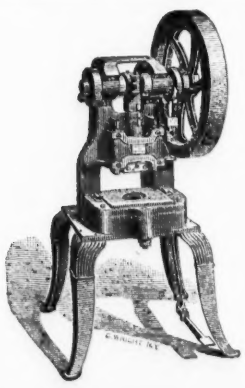

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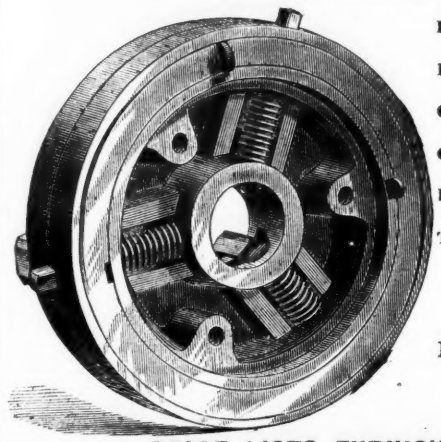

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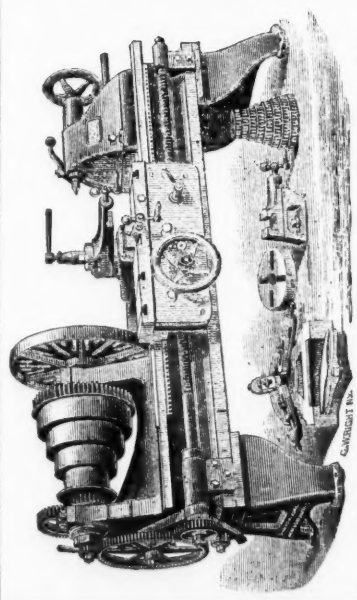

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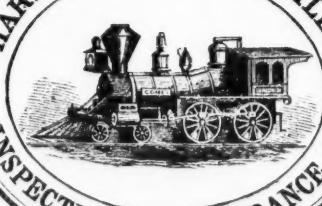

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